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92 SOLAR PHYSICS 428
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93 SPACE RADIATION 428
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99 GENERAL 428

Note: N.A. means that no abstracts were assigned to this category for this issue.

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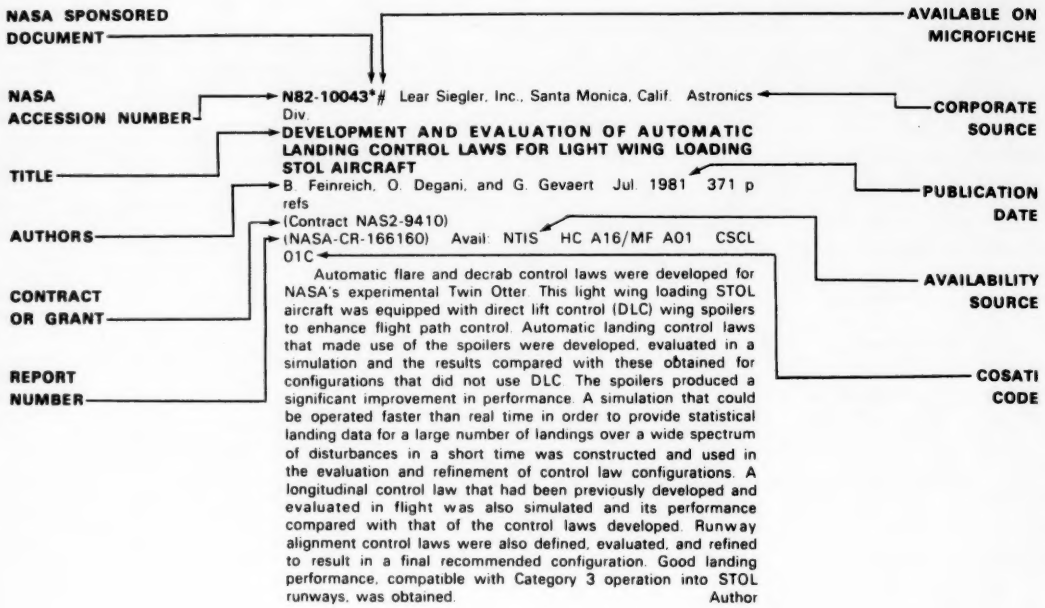
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 3 FEBRUARY 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

No abstracts in this category.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-12027 Royal Aircraft Establishment, Bedford (England).
LOW-SPEED MEASUREMENTS OF THE STATIC PRESSURE DISTRIBUTION AND OVERALL FORCES ON A CAMBERED AND A SYMMETRIC MILD GOTHIC WING OF ASPECT RATIO 1.4
P. J. Butterworth and D. G. Dobney May 1980 86 p refs (RAE-TR-80066; BR75504) Copyright. Avail: Issuing Activity

A cambered wing of aspect of ratio 1.4 was tested in a low speed wind tunnel to determine its surface static pressure distribution at its designed, attached-flow incidence for comparison with the theoretical loading. In order to enable the effects of camber on the separated-flow characteristics of this planform to be isolated, the corresponding symmetric wing was also included in the test program and the results for the two wings are compared and empirical relationships found. The lift, drag, and pitching moment characteristics of each wing were measured over a range of Reynolds number for comparison with the results of the earlier force tests and those derived by integration of the measured pressure distributions. J.M.S.

N82-12028 City Univ. of New York, N. Y.
WAKE BOUNDARY LAYER INTERACTION IN TURBOMACHINERY Ph.D. Thesis
Satya Pal 1981 314 p
Avail: Univ. Microfilms Order No. 8120764

The wake developed from the trailing edge of a thin and smooth flat plate including the effect of free stream turbulence was studied analytically as well experimentally. The experimental measurements were taken in a low speed wind tunnel using crosswire anemometry for three levels of free stream turbulence. Experimental results are presented on mean velocity profile, wake center line velocity, half with width, displacement thickness, momentum thickness, energy thickness, shape factor, components of turbulance intensity increases the wake recovery and growth rates. The analytical investigation also lead to the establishment of two turbulence parameters. These parameters simulate the effect of free stream turbulence on the wake velocity and length scales. Free stream turbulence increases the turbulence intensity and Reynolds stress in the wake. Correlations are developed to predict the decay behavior of turbulence quantities. These correlations depend upon the trailing edge conditions, free stream turbulence level, drag coefficient and distance downstream from the trailing edge. A self-preservation of wake has been taken as the basic for obtaining the correlations for turbulence quantities. Dissert. Abstr.

N82-12029 Cornell Univ., Ithaca, N. Y.
UNSTEADY BOUNDARY LAYER SEPARATION Ph.D. Thesis
Leonard Louis vanDommelen 1981 261 p
Avail: Univ. Microfilms Order No. 8119518

Some clarity is brought into the subject of boundary layer separation. In particular it is shown that the boundary layer about the impulsively started circular cylinder starts to separate from the surface after about .75 diameter movement. This is achieved by numerical integration of the initial value problem and independently by matched asymptotic expansion of the solution. Other results include a viscous-inviscid interaction solution for upstream slipping separation, a proposal for downstream slipping separation, derivation of the most general form of the semi-similar solutions, the physics behind the boundary layer singularities of Banks and Zaturska and Bodonyi and Stewartson, and the Kelvin-Helmholtz instability mechanisms of rapidly expanding vortex sheets. Dissert. Abstr.

N82-12030 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE NUMERICAL SOLUTION OF INCOMPRESSIBLE TURBULENT FLOW OVER AIRFOILS Ph.D. Thesis
Harwood Allan Hegna 1981 168 p
Avail: Univ. Microfilms Order No. 8119139

An algebraic eddy viscosity turbulence model based on Prandtl's mixing length theory was modified for separated adverse pressure gradient flows. Finite difference methods for solving the inviscid stream function equation and the incompressible laminar Navier-Stokes equations were used. A finite difference method for solving the Reynolds averaged incompressible turbulent two-dimensional Navier-Stokes equations were employed. Solutions for a NACA 0012 airfoil at angles of attack varying from five to 11.5 degrees at a chord Reynolds number of 170,000 were obtained. Velocity profiles near the airfoil surface and surface pressure distributions are presented and compared with experimental data. Lift and drag coefficients agree well with experimental values. Dissert. Abstr.

N82-12031 Arizona Univ., Tucson.
SUBCRITICAL AND SUPERCRITICAL AIRFOILS FOR GIVEN PRESSURE DISTRIBUTION Ph.D. Thesis
Ahmed Abdelatif HassanEissa 1981 82 p
Avail: Univ. Microfilms Order No. 8121930

An effective method, based on hodograph theory, was developed for the aerodynamic design of subcritical and shock-free supercritical airfoil sections. In addition to the free-stream conditions, the input to the design procedure includes a prescription of the subsonic part of a target pressure distribution and, for supercritical airfoils, of a presumed stream function on the sonic line. A computer program carries out a number of

sequential steps that result in an airfoil with a pressure distribution close to that desired at little computational cost. Thus, the airfoil designer can alter the input if design goals are not met and quickly produce another candidate airfoil. This is aided by appropriate graphic display of the airfoil and its pressure distribution. Dissert. Abstr.

N82-12032 California Inst. of Tech., Pasadena.
AN EXPERIMENTAL STUDY OF A TURBULENT VORTEX RING Ph.D. Thesis
Ari Glezer 1981 120 p
Avail: Univ. Microfilms Order No. 8121060

An apparatus was constructed to study the formation and dynamics of vortex rings. The rings were formed in water by a momentary jet discharge downward into a glass tank from an orifice in a submerged plate. The necessary impulse was provided by a pressurized reservoir and is controlled by a fast programmable solenoid valve. A particular turbulent vortex ring with a relatively thin core was chosen for detailed study. The velocity field of this ring was measured at numerous locations in the tank, using a two-channel laser-Doppler velocimeter with digital tracking electronics. Beam splitting and frequency shifting were accomplished by two partially-overlapping radial phase gratings driven by hysteresis-synchronous motors. The aim was to verify the similarity properties of the turbulent vortex ring and to determine mean particle paths and mean vorticity contours in the appropriate non-steady similarity coordinates $x/(1/4),r/t(1/4)$. Some novel pattern-recognition techniques were developed to overcome the problem of dispersion in the trajectories of individual vortices. Dissert. Abstr.

N82-12033 California Inst. of Tech., Pasadena.
THE COHERENT STRUCTURE OF TURBULENT MIXING LAYERS. 1: SIMILARITY OF THE PRIMARY VORTEX STRUCUTURE. 2: SECONDARY STREAMWISE VORTEX STRUCTURE Ph.D. Thesis
Luis Paulino Bernal 1981 106 p
Avail: Univ. Microfilms Order No. 8121056

The primary spanwise organized vortex structure and the secondary streamwise vortex structure of turbulent mixing layers were investigated. Flow visualization motion pictures of a constant density mixing layer were used to measure the properties of the large scale vortices. It was found that after an initial transition region mean of the large scale vortices reach the expected linear growth with downstream distance required by similarity. In the self-similar region, the vortex core area and visual thickness increase continuously during its life-span. A theoretical model of probability distribution function for the large-scale vortex circulation was developed. From this model the mean life-span of the vortices could also be obtained. The streamwise streak pattern observed in plan-view pictures of the mixing layer was investigated, using flow visualization and spanwise concentration measurements. It was confirmed that this pattern is the result of a secondary vortex structure dominated by streamwise, counter-rotating vortices. A detailed description of its spatial relation to the primary, spanwise vortex structure is presented. Dissert. Abstr.

N82-12034*# Raman Aeronautics Research and Engineering, Inc., Palo Alto, Calif.
AERODYNAMIC MEASUREMENTS CONCERNED WITH A TURRET MODEL
K. R. Raman May 1981 44 p refs
(Contract NAS2-10579)
(NASA-CR-166264) Avail: NTIS HC A03/MF A01 CSCL 01A

An experimental investigation was carried out in the 14 by 14 ft Ames transonic wind tunnel on a turret model. The aerodynamic parameters measured were steady and unsteady pressures (static and total fluid pressures), local mean velocities, and local mean densities at selected locations along the optical beam path for the azimuth look angles of 90, 120, and 150 degrees from the turret. The test stream Mach numbers considered are 0.55, 0.65 and 0.75, and the Reynolds number per meter is in the range of 10 million. The results indicate that severe optical degradation can be expected at aft look azimuth, angles, this degradation in optical performance increases as the azimuth angle is increased. The ratio of rms static pressure to the local mean static pressure peaks in the range of 0.07 to 0.12 and the ratio of rms total pressure to the local mean total pressure peaks in the range of 0.02 to 0.04. These values depend on the Mach number and the aft look azimuth angle. The scale lengths obtained from correlation considerations are also presented. J.M.S.

N82-12035*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESCRIPTION AND CALIBRATION OF THE LANGLEY UNITARY PLAN WIND TUNNEL
Charlie M. Jackson, Jr., William A. Corlett, and William J. Monta Nov. 1981 104 p refs
(NASA-TP-1905; L-14024) Avail: NTIS HC A06/MF A01 CSCL 01A

The two test sections of the Langley Unitary Plan Wind Tunnel were calibrated over the operating Mach number range from 1.47 to 4.63. The results of the calibration are presented along with a a description of the facility and its operational capability. The calibrations include Mach number and flow angularity distributions in both test sections at selected Mach numbers and tunnel stagnation pressures. Calibration data are also presented on turbulence, test-section boundary layer characteristics, moisture effects, blockage, and stagnation-temperature distributions. The facility is described in detail including dimensions and capacities where appropriate, and example of special test capabilities are presented. The operating parameters are fully defined and the power consumption characteristics are discussed. B.W.

N82-12036*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PULSE-FORMING NETWORK FOR PARTICLE PATH VISUALIZATION
Kenneth W. McAlister Nov. 1981 18 p refs Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-81311; A-8671; AVRADCOM-TR-81-A-21) Avail: NTIS HC A02/MF A01 CSCL 01A

A procedure is described for visualizing nonsteady fluid flow patterns over a wide velocity range using discrete nonluminous particles. The paramount element responsible for this capability is a pulse-forming network with variable inductance that is used to modulate the discharge of a fixed amount of electrical energy through a xenon flashtube. The selectable duration of the resultant light emission functions as a variable shutter so that particle path images of constant length can be recorded. The particles employed as flow markers are hydrogen bubbles that are generated by electrolysis in a water tunnel. Data are presented which document the characteristics of the electrical circuit and establish the relation of particle velocity to both section inductance and film exposure. Author

N82-12037# National Aerospace Lab., Tokyo (Japan).
WIND-TUNNEL INVESTIGATION OF THE SIDE-FORCE OF RECTANGULAR WINGLETS ON THE TIP OF A RECTANGULAR WING
Naoto Takizawa, Nagakatsu Kawahata, Noriaki Okada, and Akihito Iwasaki 1981 39 p refs Partly in JAPANESE; partly in ENGLISH
(NAL-TR-669; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Wind tunnel tests were conducted on a rectangular wind of aspect ratio 6 with a NACA0012 section to investigate side-force characteristics of a vertical rectangular winglet A or B mounted on the left wing tip. Winglet A has 1/10 the area of the wing. Winglet B has half the span of A. The installation angle of the winglets to the wind chord was variable up to 20 and the angle of the 1/3-chord flap up to 30 deg. Low speed data were obtained over angles of attack of approximately 15 deg and at angles of sideslip of 0 deg to 10 deg. The results indicate that winglets produce favorable side-force characteristics applicable to direct side-force control devices of aircraft in landing approaches particularly in cross-wind landings. In order to check the results, a simple formula is proposed to calculate the induced side-force of a winglet by the lift of the main wing on the basis of the lifting line theory. It is shown from the results that the differences of side-forces between upper left and low right winglets

of between normal and some variant winglets depend on the sign of pressure over the wing, the winglet, and the plate on the top of the winglet. J.M.S.

N82-12038# National Aerospace Lab., Tokyo (Japan).
TRANSONIC AIRFOIL DESIGN OF FULL POTENTIAL FLOW. 1: NUMERICAL PROCEDURE AND ITS COMPUTATIONAL EXAMPLES
Tomiko Ishiguro, Nobuhiko Kamiya, and Nobuhiro Kawai 1981 46 p refs In JAPANESE; ENGLISH summary
(NAL-TR-672; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A computational inverse procedure for transonic airfoils, in which geometries are determined from prescribed target pressure distributions, is presented. This is an interactive direct-inverse approach. The following two calculations are iterated until a target pressure distribution coincides with a direct solution on a temporary surface. One is the direct solution, which is calculated using the successive line over-relaxation method which solves the full inviscid compressible potential flow equation in the Neuman problem. The other is a modification of the temporary airfoil geometry, which is determined from the conservation law of mass flux using the normal velocity at the contour, which is obtained by solving the equation in the Dirichlet problem where the target pressure distribution is specified at the temporary contour. Futhermore, a boudary layer calculation is made and a displacement thickness is substracted to yield an actual airfoil geometry. Several examples illustrating this method are presented for flows with and without shock waves. Author

N82-12039*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
A VORTEX-FILAMENT AND CORE MODEL FOR WINGS WITH EDGE VORTEX SEPARATION
Jenn-Louh Pao and C. Edward Lan Nov. 1981 132 p refs (Contract NCC1-18)
(NASA-CR-164980; CRINC-FRL-424-1) Avail: NTIS HC A07/MF A01 CSCL 01A

A method for predicting aerodynamic characteristics of slender wings with edge vortex separation was developed. Semiempirical but simple methods were used to determine the initial positions of the free sheet and vortex core. Comparison with available data indicates that: the present method is generally accurate in predicting the lift and induced drag coefficients but the predicted pitching moment is too positive; the spanwise lifting pressure distributions estimated by the one vortex core solution of the present method are significantly better than the results of Mehrotra's method relative to the pressure peak values for the flat delta; the two vortex core system applied to the double delta and strake wing produce overall aerodynamic characteristics which have good agreement with data except for the pitching moment; and the computer time for the present method is about two thirds of that of Mehrotra's method. T.M.

N82-12040*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PERFORMANCE AND LOADS DATA FROM A WIND TUNNEL TEST OF A FULL-SCALE, COAXIAL, HINGELESS ROTOR HELICOPTER
Fort F. Felker, III Oct. 1981 350 p Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif.
(NASA-TM-81329; A-8732; USAAVRADCOM-TR-81-A-27) Avail: NTIS HC A15/MF A01 CSCL 01A

A full-scale XH-59A advancing blade concept helicopter was tested in Ames Research Center's 40 by 80 foot wind tunnel. The helicopter was tested with the rotor on and off, rotor hub fairings on and off, interrotor shaft fairing on and off, rotor instrumentation module on and off, and auxiliary propulsion thrust on and off. An advance ratio range of 0.25 and 0.45 with the rotor on and from 60 to 180 knots with the rotor off was investigated. Data on aerodynamic forces and moments, rotor loads, rotor control positions and viration for the XH-59A as well as the aerodynamic performance of the isolated rotor are presented. S.L.

N82-12041*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTICITY MATTERS: SOME REFLECTIONS ON TWO DECADES OF TESTING IN THE NASA LANGLEY TRANSONIC DYNAMICS TUNNEL
Wilmer H. Reed, III Sep. 1981 19 p refs Presented at the Intern. Symp. on Aeroelasticity, Nuremberg, West Germany, 5-7 Oct. 1980 - 1 Oct. 1981
(NASA-TM-83210) Avail: NTIS HC A02/MF A01 CSCL 01A

Testing of wind-tunnel aeroelastic models is a well established, widely used means of studying flutter trends, validating theory and investigating flutter margins of safety of new vehicle designs. The Langley Transonic Dynamics Tunnel was designed specifically for work on dynamics and aeroelastic problems of aircraft and space vehicles. A cross section of aeroelastic research and testing in the facility since it became operational more than two decades ago is presented. Examples selected from a large store of experience illustrate the nature and purpose of some major areas of work performed in the tunnel. These areas include: specialized experimental techniques; development testing of new aircraft and launch vehicle designs; evaluation of proposed 'fixes' to solve aeroelastic problems uncovered during development testing; study of unexpected aeroelastic phenomena (i.e., 'surprises'); control of aeroelastic effects by active and passive means; and, finally, fundamental research involving measurement of unsteady pressures on oscillating wings and control surface. A.R.H.

N82-12042*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL AND ANALYTICAL STUDIES OF A MODEL HELICOPTER ROTOR IN HOVER
F. X. Caradonna and C. Tung Sep. 1981 61 p refs Presented at the 6th European Rotorcraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980 Prepared jointly with Army Aviation Research and Development Command
(NASA-TM-81232; A-8332; USAAVRADCOM-TR-81-A-23) Avail: NTIS HC A04/MF A01 CSCL 01A

A benchmark test to aid the development of various rotor performance codes was conducted. Simultaneous blade pressure measurements and tip vortex surveys were made for a wide range of tip Mach numbers including the transonic flow regime. The measured tip vortex strength and geometry permit effective blade loading predictions when used as input to a prescribed wake lifting surface code. It is also shown that with proper inflow and boundary layer modeling, the supercritical flow regime can be accurately predicted. J.M.S.

N82-12043*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERACTION OF UPSTREAM FLOW DISTORTIONS WITH HIGH MACH NUMBER CASCADES
Gerald W. Englert 1981 21 p refs Proposed for presentation at the 27th Ann. Gas Turbine Conf., London, 18-22 Apr. 1982; sponsored by ASME
(NASA-TM-82759; E-1078) Avail: NTIS HC A02/MF A01 CSCL 01A

Features of the interaction of flow distortions, such as gusts and wakes with blade rows of advance type fans and compressors having high tip Mach numbers are modeled. A typical disturbance was assumed to have harmonic time dependence and was described, at a far upstream location, in three orthogonal spatial coordinates by a double Fourier series. It was convected at supersonic relative to a linear cascade described as an unrolled annulus. Conditions were selected so that the component of this velocity parallel to the axis of the turbomachine was subsonic, permitting interaction between blades through the upstream as well as downstream flow media. A strong, nearly normal shock was considered in the blade passages which was allowed curvature and displacement. The flows before and after the shock were linearized relative to uniform mean velocities in their respective regions. Solution of the descriptive equations was by adaption of the Wiener-Hopf technique, enabling a determination of distortion patterns through and downstream of the cascade as well as pressure distributions on the blade and surfaces. Details of interaction of the disturbance with the in-passage shock were discussed. Infuences of amplitude, wave length, and phase of the disturbance on lifts and moments of cascade configurations are presented. Numerical results are clarified by reference to an

especially orderly pattern of upstream vertical motion in relation to the cascade parameters. R.J.F.

N82-12044# Nielsen Engineering and Research, Inc., Mountain View, Calif.

A SYMPOSIUM ON TRANSONIC FLOW RESEARCH

David Nixon Sep. 1981 25 p refs Symp. held at Amer. Res. Center, 19-20 Feb. 1981

(Contract N00017-80-C-0803)

(AD-A104871; NEAR-TR-255) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report documents the organization and operation of the 'Transonic Perspective' conference held at NASA/Ames Research Center, February 19-20, 1981. After a period of decline in the 1960's transonic flow research has made rapid progress in the last decade. This is partly due to a renewed interest in the transonic regime for both military and civil aircraft and partly to the availability of large computers, which gave considerable impetus to the development of numerical prediction methods for realistic flows. However, not all the significant research of the decade is in the field of predictive methods; other topics such as experimental techniques for unsteady transonic flows and the super-critical wind technology, are also of importance. Much of the work in the various sub-topics of transonic flow research is done by small groups and sometimes these groups operate in relative isolation to other work in other topics. It is suggested, sometimes, that research workers concentrate on their own speciality so much that they consider their achievements as ends in themselves, rather than relating their results to the dominant problem of understanding and prediction of real, practical, transonic flow problems. GRA

N82-12045# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

A SOURCE-DOUBLET APPROACH TO MODELING TRIPLE EJECTOR RACK STORE CONFIGURATIONS AND FORCE CALCULATIONS Final Report, Feb. 1979 - Jul. 1980

Calvin L. Dyer and Charles B. Heath Jul. 1981 95 p refs

(AF Proj. 2403)

(AD-A105427; AFWAL-TR-81-3059) Avail: NTIS HC A05/MF A01 CSCL 20/4

The method presented in this report extends the FDL Subsonic Store Separation Program to include the aerodynamic modeling of the separating store as well as adjacent stores and the ejector rack. In the work presented in AFFDL-TR-74-130 only the volume effects of the stores and ejector rack are accounted for and Slender Body theory is used to calculate forces and moments on the separating store. In this report, doublets are used to model the upwash and sidewash of adjacent stores and the ejector rack. The induced flow-field portion of the total aircraft flow-field is included in the boundary conditions. Once the non-uniform flow-field has been modeled, three-dimensional point sources and doublets along the separating store axis are used to calculate loadings. Store loadings using Slender Body theory and the Source-Doublet method are compared to wind tunnel data. It is hoped that this method might offer a viable alternative to a complete mutual interference solution such as a paneling approach. Author (GRA)

N82-12046# Ballistic Research Labs., Aberdeen Proving Ground, Md. Ballistic Research Lab.

AUTOMATIC PLOTTING ROUTINES FOR ESTIMATING STATIC AERODYNAMIC PROPERTIES OF LONG ROD FINNED PROJECTILES FOR 2≤M≤5

William F. Donovan, Michael J. Nusca, and Susan A. Wood Aug. 1981 80 p refs

(DA Proj. 1L1-62617-AH-19)

(AD-A104900; ARBRL-MR-03123) Avail: NTIS HC A05/MF A01 CSCL 19/4

A predictive program for the estimation of static aerodynamic coefficients for long rod projectiles at 2≤M≤5 is presented in desk top (Tektronix 4051) computer context. The technique is demonstrated by application to a typical projectile for which range data is available for comparison. Author (GRA)

N82-12047# ARO, Inc., Arnold Air Force Station, Tenn.

EVALUATION AND WIND TUNNEL TESTS OF THE 4,000 LB (NORMAL-FORCE) PITCH/YAW AND ROLL DYNAMIC STABILITY BALANCE SYSTEMS FOR MEASURING DIRECT, CROSS, AND CROSS-COUPLING DERIVATIVES Final Report, 5 Jun. 1978 - 25 May 1979

T. D. Buchanan, S. M. Coulter, and E. J. Marquart Sep. 1981 79 p refs

(AD-A105122; AEDC-TR-80-12) Avail: NTIS HC A05/MF A01 CSCL 20/4

Early in the 1970's, the personnel at the Arnold Engineering Development Center (AEDC) recognized the need for a set of new dynamic test mechanisms for testing aircraft models at high angles of attack. At these angles of attack cross and cross-coupling derivatives may be significant in determining the aircraft's stability. Dynamic balances were fabricated to perform pitch, yaw, and roll dynamic stability tests of aircraft or large missile models at AEDC. The balances were designed to measure not only the direct derivatives but also cross and cross-coupling derivatives. The set of balances comprises a 4,000-lb (normal-force) roll and a 4,000-lb pitch/yaw forced-oscillation balance to measure the direct damping derivatives and a five-component can-type balance to measure the cross and cross-coupling derivatives attributable to pitch or yaw. Extensive laboratory investigations of the balances' static and dynamic response characteristics were performed before wind tunnel tests of a 1/9-scale F-16A model in the AEDC Propulsion Wind Tunnel (16T) at Mach numbers from 0.2 to 1.4. GRA

N82-12048# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.

ON VORTEX BREAKDOWN AND INSTABILITY Final Technical Report, 18 May - 25 Jul. 1980

Shiva N. Singh and Wilbur L. Hankey Wright-Patterson AFB, Ohio AFWAL Mar. 1981 32 p refs

(Contract F49620-79-C-0038; AF Proj. 2307)

(AD-A104980; AFWAL-TR-81-3021) Avail: NTIS HC A03/MF A01 CSCL 20/4

A literature survey on the vortex breakdown phenomenon is presented. Several theoretical and numerical models which have been proposed and applied to explain the experimental observations concerning vortex bursting are reviewed. Required parameters to perform the related stability analysis have been identified. Appropriate criteria where possible are cited to assist engineers in estimating occurrence of vortex bursting. A numerical scheme to compute and verify some of the results for incompressible inviscid unstable modes is programmed on the computer at WPAFB. It is suggested that the influence of adverse pressure gradient on the vortex breakdown be investigated in detail and results thus obtained be compared with experiments under appropriate conditions. Author (GRA)

N82-12049# Hamburg Univ. (West Germany). Inst. fuer Schiffbau.

CALCULATION OF STATIONARY TRANSONIC FLOWS USING THE INTEGRAL EQUATION METHOD Final Report [INTEGRALGLEICHUNGSVERFAHREN FUER STATIONAERE TRANSSONISCHE STROEMUNGEN]

R. Voss Jan. 1979 50 p refs In GERMAN

(Contract DFG-IS-10/27)

(Rept-374) Avail: NTIS HC A03/MF A01

The suitability of the integral equation method for solving complex transonic flow problems is examined. In order to take into account compression shocks occurring in transonic rotor flows, it is necessary to formulate the integral flow equations so that the contribution of the shock emerges explicitly, rendering these equations substantially more complex. The method was developed, taking as examples plane potential flow and the homogeneous stream along an airfoil. In spite of the complexity of the method, a rough approximation of the solution is obtained, serving as a starting point for a numerical difference method and representing a considerable saving of time for this computer intensive difference method. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-12050
APPLICATION OF SINGULAR PERTUBATION THEORY TO ONBOARD AIRCRAFT TRAJECTORY OPTIMIZATION Ph.D Thesis
Abhijit J. M. Chakravarty 1981 139 p
Avail: Univ. Microfilms Order No. 8121183

The problem of minimizing direct operating cost in dollars (combined cost per hour and cost of fuel per hour) for a typical commercial jet transport model is formulated via the Pontryagin minimum principle. Singular perturbation theory is applied to reduce the computational burden of solving the resulting optimal control problem. The work of p. vious investigators is extended to include the aircraft weight v riation in the state equations and the resulting seven-state m.del is analyzed for time scale separation. It is shown that a realistic time scale separation involves only two scales. The resulting model is then used to develop the inner and outer solutions as dictated by singular perturbation theory. Both the free terminal time problem and the time controlled 4-D problem are considered. A comprehensive model for the aerodynamic and fuel flow terms appearing in the equations is developed for use in optimal trajectory computation. Numerical results are presented that illustrate the nature of the optimal trajectory and the control variables. Dissert. Abstr.

N82-12051*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
TRANSPORTATION SYSTEMS EVALUATION METHODOLOGY DEVELOPMENT AND APPLICATIONS, PHASE 3 Final Report
A. Robert Kuhlthau, I. D. Jacobson, and L. C. Richards Jun. 1981 82 p
(Contract NAS1-14908)
(NASA-CR-164999; UVA/528175/MAE-CE81/101) Avail: NTIS HC A05/MF A01 CSCL 01B

Transportation systems or proposed changes in current systems are evaluated. Four principal evaluation criteria are incorporated in the process, operating performance characteristics as viewed by potential users, decisions based on the perceived impacts of the system, estimating what is required to reduce the system to practice; and predicting the ability of the concept to attract financial support. A series of matrix multiplications in which the various matrices represent evaluations in a logical sequence of the various discrete steps in a management decision process is used. One or more alternatives are compared with the current situation, and the result provides a numerical rating which determines the desirability of each alternative relative to the norm and to each other. The steps in the decision process are isolated so that contributions of each to the final result are readily analyzed. The ability to protect against bias on the part of the evaluators, and the fact that system parameters which are basically qualitative in nature can be easily included are advantageous. S.L.

N82-12052*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATION OF SEVERE LIGHTNING STRIKE INCIDENTS TO TWO USAF F-106A AIRCRAFT
J. Anderson Plumer Hampton, Va. NASA. Langley Research Center Sep. 1981 19 p
(Contract NAS1-15884)
(NASA-CR-165794; LT-80-56) Avail: NTIS HC A02/MF A01 CSCL 01C

The results of the inspection and analysis of two F-106A aircraft that were struck by separate lightning strikes within a few minutes of each other are presented. Each aircraft sustained severe lightning strikes to the pitot booms, resulting in extensive damage to the pitot heater power harness, number 8 ground wire, and lightning suppressors, but there was no damage to either aircraft's electrical or avionic systems. A simulated lightning current of 226 kA and 3.8 million A(2)*S was required to reproduce the damage to the ground wires in the radomes. Photographs and detailed assessments of the damage are included. R.J.F.

N82-12053# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
AN ANALYSIS OF CIVIL AVIATION PROPELLER-TO-PERSON ACCIDENTS: 1965-1979
William E. Collins, Angelo R. Mastrullo, William R. Kirkham, Deborah K. Taylor, and Paula M. Grape May 1981 13 p refs
(AD-A105365; FAA-AM-81-15) Avail: NTIS HC A02/MF A01 CSCL 01/2

The interest of manufacturing, governmental, and safety personnel using paint schemes on propeller and rotor blades is based on improving the visual conspicuity of those blades when they are rotating. While propeller and rotor paint schemes may serve to reduce the number of fatalities and injuries due to contact with a rotating blade there is little information available regarding analyses of the circumstances surrounding such accidents. Brief reports provided by the National Transportation Safety Board of all 'propeller-to-person' accidents from 1965 through 1979 were examined and analyzed in terms of airport lighting conditions, actions of pilots, actions of passengers and ground crew, phase of flight operation, weather conditions, and others. Analyses based on a total of 319 accidents showed a marked drop in the frequency of 'propeller-to-person' accidents from 1975 through 1978. Several types of educational efforts directed toward pilots and ground crew, both prior to and during that 4-year period, were examined as possible factors contributing to the accident rate decline. Accident patterns provide a basis for assessing the probable efficacy of various recommendations (including propeller conspicuity) for further reducing 'propeller-to-person' accidents. Author (GRA)

N82-12054# Federal Aviation Administration, Washington, D.C. Office of Aviation Safety.
COMPUTER AIR CARRIER SYMPOSIUM
16 Jan. 1981 248 p refs Symp. held at Washington, D.C., 15-16 Jan. 1981
(AD-A104894; FAA-ASF-300-81-6) Avail: NTIS HC A11/MF A01 CSCL 01/2

Partial Contents: Working Session I -- Simulation, Fitness, and Safety Analysis; Working Session II -- Airports and Airways; and Working Session III -- Human Factors. GRA

N82-12055# Federal Aviation Administration, Washington, D.C. Office of Aviation Safety.
SUMMARY OF FEDERAL AVIATION ADMINISTRATION RESPONSES TO NATIONAL TRANSPORTATION SAFETY BOARD SAFETY RECOMMENDATIONS Quarterly Report, Jan. - Mar. 1981
R. E. Livingston and C. A. Carpenter Apr. 1981 243 p refs
(AD-A104922; FAA-ASF-81-3) Avail: NTIS HC A11/MF A01 CSCL 01/2

This report contains NTSB recommendations and all FAA responses to Board recommendations that were delivered to the Board during the applicable quarter. In addition, the report includes NTSB requests and FAA responses concerning reconsiderations, status reports, and followup actions. The Table of Contents for this report reflects only those NTSB recommendations which are still open pending FAA action (i.e., those that have not been designated as 'Closed' by the NTSB as a result of acceptable action). Accordingly, the Table of Contents may reflect a number of multiple recommendations (example: A-79-21 through 24), but background material is included only for those recommendations which remain in an 'Open' status. Background information for those recommendations which have been closed is available in FAA Headquarters files. Author (GRA)

N82-12056# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
INDEX OF NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER TECHNICAL REPORTS 1972 - 1977 Final Report, 1972 - 1977
Ruth J. Farrell, comp. and Nancy G. Boylan, comp. May 1981 201 p
(FAA Proj. 999-113-000)
(AD-A104759; FAA-CT-81-54) Avail: NTIS HC A10/MF A01 CSCL 01/3

This report is an index of all technical reports which were assigned NA numbers and published by NAFEC during the period 1972 through 1977. Entries are arranged by NA number and include titles, authors and full abstracts. Separate sections contain indexes by subject, author, and RD number. Author (GRA)

N82-12057# Textron Bell Helicopter, Fort Worth, Tex.
INVESTIGATION OF THE STRUCTURAL DEGRADATION AND PERSONNEL HAZARDS RESULTING FROM HELICOPTER COMPOSITE STRUCTURES EXPOSED TO FIRES AND/OR EXPLOSIONS Final Report, Mar. 1979 - Dec. 1980
Raymond J. Schiltz, Jr. Aug. 1981 111 p refs
(Contract DAAK51-79-C-0009; DA Proj. 1L1-62209-AH-76) (AD-A104757; USAAVRADCOM-TR-81-D-16) Avail: NTIS HC A06/MF A01 CSCL 13/12

A program was undertaken to investigate the structural degradation and personnel hazards resulting from exposure of helicopter composite structures to fire and/or explosion. The program consisted of a technical survey, a test program, and an analysis phase. A major part of the technical survey was a literature survey. In addition, organizations working in the fields of interest were contacted for information, and some were visited for further, detailed discussions. The computer programs currently available for modeling enclosure fires were screened, and one was chosen for further study. The test program consisted of a series of tests on two representative helicopter structures: a sheet-stiffened, built-up door of Kevlar 49 fabric impregnated with an epoxy resin, and a honeycomb sandwich fuselage shell structure of graphite/epoxy fabric skins on a Nomex honeycomb core. The tests conducted on materials from these structures were smoke generation tests, and structural degradation tests. Ballistic tests on the complete test article were conducted to determine whether the structures would ignite under HEI impact conditions. Based on the survey and testing, design criteria for structural composite components were investigated and, when appropriate, formulated. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-12058# National Aerospace Lab., Tokyo (Japan).
STUDY ON STRAPDOWN INERTIAL NAVIGATION REDUNDANT SENSOR SYSTEM
Hirokimi Shingu 1981 26 p refs In JAPANESE; ENGLISH summary
(NAL-TR-660; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

An efficient method of increasing the reliability of a strapdown inertial navigator by use of a redundant sensor is described along with a preliminary technique to detect and isolate the sensor failures, and how to determine the tolerance limits of the detection delay. The reliability and the accuracy of various redundant systems using four five and six-sensor are analyzed. It is found that models of nonorthogonal orientation have higher reliability than those of orthogonal orientation using the same number of sensors. If the sensor arrays are optimum, the improvement of accuracy was found to be 13.4%, 22.5%, and 29.3% for four five and six-sensor systems in comparison with conventional three-sensor arrays when all sensors are operating normally. A trail to detect a sensor failure and to find a way to compensate for performance degradation of a system is done by using a set of parity equations. The system is a six-sensor array. The method is one of substituting the integrated values of the sensor data into those equations in order that the detection performance be better. The detection is evaluated as a quantitative relation to the navigational error on the assumption that a redundant system is employed for a mission. J.M.S.

N82-12059# Federal Aviation Administration, Atlantic City, N.J.
FLIGHT EVALUATION OF LORAN-C AS A HELICOPTER NAVIGATION AID IN THE BALTIMORE CANYON OIL EXPLORATION AREA Final Report, Mar. - May 1979
William A. Lynn May 1981 43 p
(FAA Proj. 045-390-130)
(AD-A105260; FAA-CT-80-53; FAA-RD-81-27) Avail: NTIS HC A03/MF A01 CSCL 17/7

A series of flight tests were conducted to investigate the use of long range navigation (LORAN)-C as a helicopter navigation system in the offshore New Jersey Baltimore Canyon oil exploration area. Tests were flown aboard the Federal Aviation Adminstration (FAA) Technical Center's CH-53A using a Teledyne Systems TDL-711 LORAN Micro-Navigator. The purpose of the tests was to determine the accuracy and operational usability of LORAN-C for offshore en route navigation and nonprecision approaches. The total system accuracy met or exceeded the requirements of Advisory Circular (AC) 90-45A 'Accuracy Requirements of Area Navigation Systems' for terminal and en route phases of flight, provided the proper LORAN triads were selected. The LORAN-C System did not meet AC 90-45A nonprecision approach accuracy criteria. Author (GRA)

N82-12060# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
THE USE OF GROUNDSPEED, IN A WIND SHEAR AND THE FLIGHT EVALUATION OF A RADAR-ALTIMETER-BASED SYSTEM FOR THE MEASUREMENT OF GROUNDSPEED Final Report, Jan. 1978 - Oct. 1980
David Lawrence Jul. 1981 44 p refs
(AD-A104758; FAA-CT-81-34; ACT-100F) Avail: NTIS HC A03/MF A01 CSCL 04/2

The use of groundspeed in combination with airspeed has been considered and shown to be an effective aid in the execution of an approach and landing in a heavy jet transport airplane. A flight dynamics analysis shows that the response of such aircraft to sudden changes in headwind is quite sluggish, requiring more than 100 seconds for equilibrium conditions to be regained in the worst case. A feasibility demonstration model of a radar-altimeter-based system for the measurement of groundspeed has been subjected to a limited in-flight evaluation. It is a self-contained unit requiring no ground-based equipment and no on-board equipment other than the small flush transmit and receive antennas and the associated cable runs. While the current unit does not meet the desired accuracy standard (delta = + or 3 knots, or less), it approaches it at times, and greater accuracy can be achieved with further development. Responsiveness to rapidly changing groundspeed matched that of the reference inertial navigation system; and satisfactory groundspeed tracking was maintained during turning, climbing, and descending flight. Author (GRA)

N82-12061# Ohio Univ., Athens. Dept. of Electrical Engineering.
MLS PERFORMANCE ASSESSMENT, TASK 4. VOLUME 1: EVALUATION PROCEDURES AND EQUIPMENT DESIGN Final Report
Robert W. Lilley, Richard H. McFarland, and Walter D. Phipps Dec. 1980 83 p refs
(Contract DOT-FA79NA-6030)
(AD-A105393; EER-47-2-Vol-1; FAA-CT-81-50-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 17/7

Preliminary flight-check procedures and system tolerances for the Microwave Landing System (MLS) are presented. A data-collection and recording package for use in light-aircraft measurement of MLS parameters in support of the System Test and Evaluation Program (STEP) is included containing a ground reference system, digital telemetry link airborne MLS sensor unit and system computation/display element. Author (GRA)

N82-12062# Teledyne Systems Co., Northridge, Calif.
DESIGN STUDY REPORT FOR GENERAL AVIATION LORAN-C RECEIVER Final Report
H. L. Walker and R. Ellerbe May 1981 257 p
(Contract DT-FA01-80-C-10108)
(AD-A104921; FAA/RD-81/36) Avail: NTIS HC A12/MF A01 CSCL 17/7

This document summarizes the results of studies and trade-off

analysis conducted for a low cost Loran-C Receiver. The Loran-C Receiver is intended to meet the Minimum Operational Performance Standards for area Navigation (RNAV) equipment for General Aviation Aircraft operating in the National Aerospace System. The studies and analysis examined the required receiver performance, design approaches and design criteria, and cost to the user of the receiver. The study concludes that a low cost receiver meeting the General Aviation RNAV requirements is practical. A design approach for the receiver is described.
Author (GRA)

N82-12063# Technische Hogeschool, Delft (Netherlands).
ORIENTING DESCRIPTION OF AIR TRAFFIC CONTROL IN THE NETHERLANDS [ORIENTERENDE BESCHRIJVING VAN DE LUCHTVERKEERSLEIDING IN NEDERLAND]
W. H. vanTuijl Aug. 1979 84 p refs In DUTCH
(VTH-LR-285) Avail: NTIS HC A05/MF A01

A general impression is given of air traffic control (ATC) in the Netherlands and of the signal automatic radar data processing (SARP) air traffic control system for Schiphol airport emphasizing safety and efficiency. Flight conditions, air structure, and navigation and landing aids of the ATL system are described. In the SARP system, data relative to position and flight plans are, on a real time basis, processed by a set of computers and distributed. Task sharing in SARP, its technical layout, its operational layout, operational functions and flight data are reviewed. Author (ESA)

N82-12064# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
THE EFFECT OF VISUAL INFORMATION ON MANUAL APPROACH AND LANDING
P. H. Wewerinke 28 Apr. 1980 20 p refs Presented at 16th Ann. Conf. on Manual Control, Cambridge, Mass., 5-7 May 1980 Abbreviated version of NLR-TR-80055-U
(NLR-MP-80019-U; NLR-TR-80055-U) Avail: NTIS HC A02/MF A01

The effect on approach performance of visual scene information, in combination with basic display information, is discussed for the manual approach and landing task. Good, poor, and night visibility conditions are considered, combined with basic head-up display configurations representing a variety of visual cues (runway contours, etc). A pre-experimental model analysis was performed in terms of an optimal control model. The resulting aircraft approach performance predictions were compared with the results of a moving base simulator program. The results illustrate that the model provides a meaningful description of the visual (scene) perception process involved in the complex (multivariable, time varying) manual approach task with a useful predictive capability. The theoretical framework is shown to allow a straight forward investigation of the complex interaction of a variety of task variables. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-12065*# Foster-Miller Associates, Inc., Waltham, Mass.
EXPERIMENTAL AND ANALYTICAL STUDIES OF ADVANCED AIR CUSHION LANDING SYSTEMS Final Report
E. G. S. Lee, A. B. Boghani, K. M. Captain, H. J. Rutishauser, H. L. Farley, R. B. Fish, and R. L. Jeffcoat Washington NASA Nov. 1981 188 p refs
(Contract NAS1-15051)
(NASA-CR-3476) Avail: NTIS HC A09/MF A01 CSCL 01C

Several concepts are developed for air cushion landing systems (ACLS) which have the potential for improving performance characteristics (roll stiffness, heave damping, and trunk flutter), and reducing fabrication cost and complexity. After an initial screening, the following five concepts were evaluated in detail: damped trunk, filled trunk, compartmented trunk, segmented trunk, and roll feedback control. The evaluation was based on tests performed on scale models. An ACLS dynamic simulation developed earlier is updated so that it can be used to predict the performance of full-scale ACLS incorporating these refinements. The simulation was validated through scale-model tests. A full-scale ACLS based on the segmented trunk concept was fabricated and installed on the NASA ACLS test vehicle, where it is used to support advanced system development. A geometrically-scaled model (one third full scale) of the NASA test vehicle was fabricated and tested. This model, evaluated by means of a series of static and dynamic tests, is used to investigate scaling relationships between reduced and full-scale models. The analytical model developed earlier is applied to simulate both the one third scale and the full scale response. S.L.

N82-12066# Aeronautical Research Labs., Melbourne (Australia).
FLIGHT TRAIL OF THE AIRCRAFT FATIGUE DATA ANALYSIS SYSTEM (AFDAS) Mk 2 PROTOTYPE
P. J. Howard Dec. 1980 37 p refs
(AD-A105270; ARL/STRUC-NOTE-466; AR-002-249) Avail: NTIS HC A03/MF A01 CSCL 01/3

A prototype version of the Aircraft Fatigue Data Analysis System (AFDAS) has been evaluated in flight trials by a comparison with continuously recorded data. Over a limited period of test the range-mean-pairs count of strain cycles was the same for both sets of data, and the gains calculated for the AFDAS are identical to those deduced from the continuous record. Author (GRA)

N82-12067# General Electric Co., Binghamton, N.Y. Aircraft Equipment Div.
ELECTRONIC MASTER MONITOR AND ADVISORY DISPLAY SYSTEM (EMMADS) Final Report, Jun. 1977 - Jun. 1981
Jun. 1981 38 p refs
(Contract DAAK80-79-C-0270; DA Proj. 1L2-62202-AH-85)
(AD-A105082; ACS-12386; USAAVRADCOM-TR-79-F-270)
Avail: NTIS HC A03/MF A01 CSCL 01/3

The design and fabrication of a programmable feasibility model of an electronic master monitor and advisory display system for helicoptrs is described. Functional requirements and system interfaces for signal analysis were determined for the helicopters studied. Human factors studies developed formats for reducing crew workloads and maximizing crew performance. Methods of data transfer from sensors to the monitor system were analyzed and appropriate interfaces and data transmission media were recommended. The programmable feasibility model is discussed.
R.J.F.

N82-12068# McDonnell Aircraft Co., St. Louis, Mo.
APPLICATION OF PULSE CODE MODULATION (PCM) TECHNOLOGY TO AIRCRAFT DYNAMICS DATA ACQUISITION Final Report, May 1979 - Jan. 1981
C. A. Detmer, C. J. Guenther, and J. H. Rixleben Apr. 1981 431 p refs
(Contract F33615-79-C-3205; AF Proj. 2401)
(AD-A104775; AFWAL-TR-81-3017) Avail: NTIS HC A19/MF A01 CSCL 14/2

AFWAL/FIBG has a facility that provides dynamics data acquisition and analysis to support ground and flight testing on Air Force systems. This capability is limited by the current analog data acquisition technology to the acquisition of 12 data channels simultaneously of 40 to 50 dB dynamic range. This report documents a study conducted to obtain an optimum data acquisition and analysis system using PCM technology to provide simultaneous acquisition of 144 channels with 60 to 70 dB dynamic range. Implementation of this design will advance the state-of-the-art for acquisition of high bandwidth (20 KHz) dynamics data and will result in a significant reduction in the cost of flight tests. Author (GRA)

N82-12069# Aeronautical Research Labs., Melbourne (Australia).
A VAPOUR CYCLE CABIN COOLING SYSTEM FOR THE SEA KING MK.50 HELICOPTER
Brian Rebbechi Feb. 1980 59 p refs
(AD-A105211; ARL/MECH-ENG-155; AR-001-793) Avail: NTIS HC A04/MF A01 CSCL 13/1

An experimental determination has been made of the design requirements for a cabin cooling system in the Sea King Mk. 50

helicopter. The purpose of this system is to bring the cabin environment in the helicopter to an acceptable level for effective crew performance. Cooling was provided by an experimental vapour cycle cooling system. Results of the trials have been used to formulate a heat transfer model of the cabin to enable prediction of required cooling capacity for extreme climatic conditions. A comparison, based on the trials results, is made between the performance attainable by a vapour cycle cooling system, and an air cycle system using the available engine bleed. Author (GRA)

N82-12070# Hochschule der Bundeswehr, Munich. (West Germany). Flugmechanik und Flugfuehrung.
EFFECTS OF AERODYNAMIC COUPLING ON THE DYNAMICS OF ROLL AIRCRAFT
Gottfried Sachs and Werner Fohrer Jan. 1981 48 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC A03/MF A01

The effects of coupling of longitudinal and lateral aerodynamic characteristics on the dynamics of aircraft roll were studied, using simplified relations and complete six-degree of freedom calculations. The aerodynamic coupling is caused by unsymmetric flow conditions resulting from sideslipping, where rolling moments due to angle of attack and pitching moments due to angle of sideslip, are of particular significance for the problem. It is shown that the attainable rate of roll is significantly influenced and that marked effects on stability are possible. Furthermore, it is shown that aerodynamic coupling can cause autorotation, i.e., a rolling motion without aileron forcing moments. Author (ESA)

N82-12071# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
MATHEMATICAL MODELS AND DIGITAL SIMULATION OF HYDRAULIC CONSTANT SPEED DRIVE UNITS FOR AIRCRAFT ELECTRICAL SUPPLY SYSTEMS, VOLUME 1
L. Tsitsilonis and D. McLean Aug. 1981 180 p refs
(Contract Min-DEF/ERC/9/4/2170/074XR/EP)
(TT-8102-Vol-1) Avail: NTIS HC A09/MF A01

A mathematical model which represents the dynamic behavior of hydraulic constant speed drive units (CSDU) is presented. The model forms the basis of a complete digital simulation program, written in the ICL Continuous System Simulation Language (CSSL) called SLAM. The CSDU's used are sunstrand AE 8906 and AE 8050. Dynamic responses, obtained from AE 8050, are compared with similar responses obtained from digital simulation studies in order to validate the model. A number of suggestions are also presented for future application and extension of the mathematical model and the corresponding simulation. These include the use of electronic governing and the possible use of a CSDU as a starter generator. Author (ESA)

N82-12072# Engins Matra, Velizy (France). Lab. Central.
ADVANTAGES AND LIMITATIONS OF VARIOUS MATERIALS USED IN THE CONSTRUCTION OF MODULES [ATOUT ET LIMITES D'EMPLOIS DES DIVERS MATERIAUX UTILISES DANS LA CONSTRUCTION DES CELLULES]
G. Hilaire 30 Jul. 1981 39 p In FRENCH Presented 9th Colloq. Aciers et Alliages Speciaux dans les Ind. Aerospatiales, Le Bourget, France, 11 Jun. 1981
(SNIAS-812-551-103; C-42796) Avail: NTIS HC A03/MF A01

Steels, light alloys, titanium alloys, and composites are compared for economy, mechanical characteristics, energy content, fatigue effects and toughness. The use of these materials in civil and military aircraft, helicopters, and engines is surveyed. Increasing use of composites is forecast for the next decade, with a corresponding drop in the use of light alloys. Steels and titanium alloys should not be affected. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-12073 Washington Univ., Seattle.
INSTRUMENT FAILURE DETECTION FOR A LINEAR UNCERTAIN SYSTEM Ph.D. Thesis
Wen-Kuang Chen 1981 225 p
Avail: Univ. Microfilms Order No. 8121186

Software redundancy techniques were applied to detect the identify instrument failures for a system modeled by a set of linear uncertain dynamic equations. Classical and geometric approaches were employed to specify a condition on the structure of the system and the uncertainties in order to design a dedicated observer scheme (DOS). The DOS detects and identifies instrument failure for a linear uncertain system. In the observable subspace, a special direction called zero sensitive direction is found. In this direction, the observer is insensitive to system uncertainties and it will observe a linear combination of the state variables for a linear uncertain system unless the observer is driven by a faulty instrument. The geometric approach shows how to design the observer (to find the observer gain vector) and what the zero sensitive direction should be (to find a matrix representing that direction). This employs mapping theory of linear algebra rather than solving equations and inequalities. A cart-motor-inverted pendulum system is taken as an example, in which the length of the pendulum is assumed uncertain. Dissert. Abstr.

N82-12074# Air Force Flight Test Center, Edwards AFB, Calif. Flight Dynamics Div.
AFFTC STANDARD AIRSPEED CALIBRATION PROCEDURES Final Report
Albert G. DeAnda Jun. 1981 162 p refs
(AD-A104830; AFFTC-TIH-81-5) Avail: NTIS HC A08/MF A01 CSCL 01/4

This handbook has been compiled as a reference for use by AFFTC flight test engineers in the standard flight test methods, techniques and procedures for airspeed calibrations. Suggested airspeed calibration data reduction methods are presented. Some of the information included in this reference applies to the local AFFTC facilities; however, the data reduction outlines are for general application. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-12075*# General Electric Co., Lynn, Mass. Aircraft Engine Group.
EFFECT OF A PART SPAN VARIABLE INLET GUIDE VANE ON TF34 FAN PERFORMANCE Final Report
Jose Alvarez and Paul W. Schneider Sep. 1981 133 p refs
(Contract NAS3-21624)
(NASA-CR-165458; R81AEG030) Avail: NTIS HC A07/MF A01 CSCL 21E

Experimental aerodynamic and performance data were obtained from a TF34 engine. Part span variable inlet guide vanes mounted in front of the fan on the TF34 engine were tested to demonstrate the feasibility of modulating air flow and thrust for vertical takeoff aircraft systems. The fan was mapped to stall for a range of speeds and variable inlet guide were settings. Modulated fan tip performance and unmodulated hub performance were evaluated with a without an extended fan bypass splitter. The effect of a crosswind distortion screen on performance was also evaluated. R.J.F.

N82-12076# Aeronautical Research Labs., Melbourne (Australia). Mechanical Engineering Dept.
VIBRATION TEST PROCEDURES FOR ACCESSORY ANGLE DRIVE GEARBOXES ON ATAR 09C ENGINES
P. D. McFadden and D. H. Edwards Mar. 1981 57 p refs
(AD-A105269; ARL/MECH-ENG-TM-408; AR-002-264) Avail: NTIS HC A04/MF A01 CSCL 21/5

The Accessory Angle Drive gearbox powers the fuel and hydraulic pumps on the Atar engine in the Mirage aircraft. To insure against in-flight failure, each gearbox is vibration tested under load after overhaul by the local contractor. A new vibration testing technique, offering greatly improved accuracy and reliability, has been developed. The technique uses a real-time, fast-fourier spectrum analyzer, with direct digital read-out in engineering units, and a tracking adapter with built-in antialiasing filter. This report defines correct procedures for the connection and operation of the instruments, and the interpretation of the results. Author (GRA)

N82-12077# Lucas Group Services Ltd., Solihull (England).
THE USE OF METAL FINISHING IN AIRCRAFT FUEL SYSTEMS
S. L. Forgham and H. L. Tulloch 1981 28 p refs
Avail: NTIS HC A03/MF A01

Topics discussed are: (1) corrosion resistant finishes; (2) finishes to aid manufacture; (3) repair and overhaul; and (4) bearing finishes. In the case of (1) hydrogen embrittlement is identified as a major problem and processes generating hydrogen at the surface should be closely controlled. Results on drawing size of cadmium plating of rotor blades are presented. Various techniques of electrodepositing are compared. Pump rig tests on fuels containing chlorides, showing the effect on torque of additives after a 5 hr run and an additional 16 hr standing, are reported. Author (ESA)

N82-12078# European Space Agency, Paris (France).
THREE DIMENSIONAL FLOW INVESTIGATION WITH A METHOD OF CHARACTERISTICS IN THE INLET REGION AND THE BLADE-TO-BLADE CHANNELS OF SUPERSONIC AXIAL COMPRESSORS Ph.D. Thesis - Paris Univ. 6
Jean Martinon Sep. 1981 341 p refs Transl. into ENGLISH of 'Etude, au moyen d'une methode de bicaracteristiques, de l'ecoulement tridimensionnel dans la region d'entree et les canaux interaubes d'une roue de compresseurs axiaux supersoniques', ONERA, Paris Report ONERA-P-1979-1, 1979 Original report in FRENCH previously announced as N80-23325
(ESA-TT-637; ONERA-P-1979-1) Avail: NTIS HC A15/MF A01

A three dimensional method of characteristics is developed for the calculation of the supersonic flow in the inlet region and the blade-to-blade channels of blade cascades and high transonic axial flow compressors with subsonic or supersonic axial velocity. The numerical scheme is accurate, and required computer times are short. Results of calculations on several linear or annular cascades and rotating blade rows are presented and compared with test results. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-12079*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
RELIABILITY ANALYSIS OF THE F-8 DIGITAL FLY-BY-WIRE SYSTEM
L. D. Brock and H. A. Goodman Oct. 1981 152 p refs
(Contract NAS4-2571)
(NASA-CR-163110; R-1324) Avail: NTIS HC A08/MF A01 CSCL 01C

The F-8 Digital Fly-by-Wire (DFBW) flight test program intended to provide the technology for advanced control systems, giving aircraft enhanced performance and operational capability is addressed. A detailed analysis of the experimental system was performed to estimated the probabilities of two significant safety critical events: (1) loss of primary flight control function, causing reversion to the analog bypass system; and (2) loss of the aircraft due to failure of the electronic flight control system. The analysis covers appraisal of risks due to random equipment failure, generic faults in esign of the system or its software, and induced failure due to external events. A unique diagrammatic technique was developed which details the combinatorial reliability equations for the entire system, promotes understanding of system failure characteristics, and identifies the most likely failure modes. The technique provides a systematic method of applying basic probability equations and is augmented by a computer program written in a modular fashion that duplicates the structure of these equations. S.L.

N82-12080*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
COMPUTATIONAL METHODS OF ROBUST CONTROLLER DESIGN FOR AERODYNAMIC FLUTTER SUPPRESSION Final Report, 14 Nov. 1980 - 15 Nov. 1981
Leonard R. Anderson 15 Nov. 1981 86 p refs Presented at the 3rd Intern. Conf. on Math., Calif., 29-31 Jul. 1981 Submitted for publication
(Grant NAG1-80)
(NASA-CR-164983; VPI-Aero-125) Avail: NTIS HC A05/MF A01 CSCL 01C

The development of Riccati iteration, a tool for the design and analysis of linear control systems is examined. First, Riccati iteration is applied to the problem of pole placement and order reduction in two-time scale control systems. Order reduction, yielding a good approximation to the original system, is demonstrated using a 16th order linear model of a turbofan engine. Next, a numerical method for solving the Riccati equation is presented and demonstrated for a set of eighth order random examples. A literature review of robust controller design methods follows which includes a number of methods for reducing the trajectory and performance index sensitivity in linear regulators. Lastly, robust controller design for large parameter variations is discussed. R.J.F.

N82-12081# Tel-Aviv Univ. (Israel). Dept. of Electronic Systems.
FIXED GAIN CONTROLLER DESIGN FOR AIRCRAFT Final Scientific Report, 1 Jun. 1980 - 31 May 1981
Yoram Baram and Doran Eidelman 30 Jun. 1981 31 p refs
(Grant AF-AFOSR-0178-80; AF Proj. 2301)
(AD-A104877; ESTTR-81-06; SCIENTIFIC-2; EOARD-TR-81-10) Avail: NTIS HC A03/MF A01 CSCL 01/3

A Method for designing fixed gain controllers and filters for systems with large parameter variation is presented. The approach, based of minimax information criteria, is used to design a non-adaptive back-up control system for a given aircraft and is shown to provide good performance qualities. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-12082*# Computer Sciences Corp., Mountain View, Calif.
SIMULATOR CERTIFICATION METHODS AND THE VERTICAL MOTION SIMULATOR Final Report
Thomas W. Showalter 23 Sep. 1981 67 p refs
(Contract NAS2-9741)
(NASA-CR-166252) Avail: NTIS HC A04/MF A01 CSCL 14B

The vertical motion simulator (VMS) is designed to simulate a variety of experimental helicopter and STOL/VTOL aircraft as well as other kinds of aircraft with special pitch and Z axis characteristics. The VMS includes a large motion base with extensive vertical and lateral travel capabilities, a computer generated image visual system, and a high speed CDC 7600 computer system, which performs aero model calculations. Guidelines on how to measure and evaluate VMS performance were developed. A survey of simulation users was conducted to ascertain they evaluated and certified simulators for use. The results are presented. S.L.

N82-12083# National Aerospace Lab., Tokyo (Japan). Aerodynamics Div.

CONSTRUCTION AND PERFORMANCE OF NAL TWO-DIMENSIONAL TRANSONIC WIND TUNNEL

1980 104 p refs In JAPANESE; ENGLISH summary
(NAL-TR-647; ISSN-0389-4010) Avail: NTIS HC A06/MF A01

The construction and the results of initial calibration are described. This tunnel was built to meet the requirements of high Reynolds number testing of wing sections at transonic regime. It is a blowdown tunnel with a test section of 0.3m x 1.0m. The required capability of this wind tunnel is for Mach numbers ranging from 0.2 to 1.2 and for a Reynolds number up to 40 million at Mach number 0.8 with sufficient running time. An outline of the design objectives is given. The completed facilities, i.e., the wind tunnel, the instrumentation and operation system, the silencer and auxiliary equipment of the air compressor and the air reservoir, are described in detail. The performance of the tunnel when it is empty is described, and the results of a few experiments with an airfoil model of the NACA 64A410 are presented. High Reynolds number testing can be achieved in this wind tunnel without any trouble. B.W.

N82-12084*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

RESEARCH DEVELOPING CLOSED LOOP ROLL CONTROL FOR MAGNETIC BALANCE SYSTEMS Semiannual Status Report, 1 Feb. - 31 Jul. 1981

Eugene E. Covert and Charles W. Haldeman 31 Jul. 1981 50 p refs
(Grant NsG-1502)
(NASA-CR-164989; SAR-7) Avail: NTIS HC A03/MF A01 CSCL 14B

Computer inputs were interfaced to the magnetic balance outputs to provide computer position control and data acquisition. The use of parameter identification of a means of determining dynamic characteristics was investigated. The thyraton and motor generator power supplies for the pitch and yaw degrees of freedom were repaired. Topics covered include: choice of a method for handling dynamic system data; applications to the magnetic balance; the computer interface; and wind tunnel tests, results, and error analysis. A.R.H.

N82-12085*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A LOOK INSIDE THE LANGLEY 16-FOOT TRANSONIC TUNNEL: USER'S GUIDE

Kathryn H. Peddrew, comp. Aug. 1981 197 p refs
(NASA-TM-83186) Avail: NTIS HC A09/MF A01 CSCL 14B

The 16-foot transonic tunnel is a single-return atmospheric wind tunnel having a slotted test section. The primary emphasis for research in this facility is the integration of the propulsion system into advanced aircraft concepts. The large test section size, 15.5 feet in diameter lends itself to conducting research in this area, where large models are required in order to provide adequate definition of the model geometry associated with the integration of the propulsion system. The nominal test Mach number range for this facility varies from 0.20 to 1.3. Topics covered include (1) facility description; (2) model installation equipment for aerodynamics; (3) model support system for propulsion simulation testing; (4) propulsion simulation systems; (5) calibrating propulsion simulation systems; (6) instrumentation; (7) data acquisition; (8) model design criteria; and (9) wind tunnel test planning. A.R.H.

N82-12086# Sandia Labs., Albuquerque, N. Mex. Central Receiver Test Facility Div.

USE OF SANDIA'S CENTRAL RECEIVER TEST FACILITY AS A HIGH-INTENSITY HEAT SOURCE FOR TESTING MISSILE NOSE-CONE (RADOME) RADAR SYSTEMS

Donald R. Porter Sep. 1981 26 p ref
(Contract DE-AC04-76DP-00789)
(DE82-000968; SAND-81-1025) Avail: NTIS HC A03/MF A01

A series of tests at Sandia's Central Receiver Test Facility in support of the US Navy's SM-2 Blk 2 Radome Improvement Program is described. The CRTF was the source of high-intensity solar radiation for testing onboard radar-tracking systems under heating conditions intended to simulate those that occur in supersonic flight. Also discussed are the hardware used and the software developed at the CRTF. DOE

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

N82-12087*# Hughes Aircraft Co., El Segundo, Calif.

PC-403: PIONEER VENUS MULTIPROBE SPACECRAFT MISSION OPERATIONAL CHARACTERISTICS DOCUMENT, VOLUME 1

F. C. Barker 22 May 1978 339 p 3 Vol.
(Contract NAS2-9366)
(NASA-CR-166261-Vol-1; HS507-7517-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 22A

The operational characteristics of the multiprobe system and its subsystem are described. System level, description of the nominal phases, system interfaces, and the capabilities and limitations of system level performance are presented. Bus spacecraft functional and operational descriptions at the subsystem and unit level are presented. The subtleties of nominal operation as well as detailed capabilities and limitations beyond nominal performance are discussed. A command and telemetry logic flow diagram for each subsystem is included. Each diagram identifies in symbolic logic all signal conditioning encountered along each command signal path into, and each telemetry signal path out of the subsystem. S.L.

N82-12088*# Hughes Aircraft Co., El Segundo, Calif.

PC-403: PIONEER VENUS MULTIPROBE SPACECRAFT MISSION OPERATIONAL CHARACTERISTICS DOCUMENT, VOLUME 2

F. C. Barker 22 May 1978 385 p 3 Vol.
(Contract NAS2-9366)
(NASA-CR-166261-Vol-2; HS507-7517-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 22A

The data handling subsystem, command subsystem, communications subsystem, power subsystem, and mission operations of the Pioneer Venus multiprobe are presented. The multiprobe spacecraft performance in normal operating modes that correspond to the performance of specific functions at the time of specific events in the mission is described. S.L.

N82-12089*# Hughes Aircraft Co., El Segundo, Calif.

PC-403: PIONEER VENUS MULTIPROBE SPACECRAFT MISSION OPERATIONAL CHARACTERISTICS DOCUMENT, VOLUME 3

F. C. Barker 22 May 1978 385 p 3 Vol.
(Contract NAS2-9366)
(NASA-CR-166261-Vol-3; HS507-7517-Vol-3) Avail: NTIS HC A17/MF A01 CSCL 22A

The Pioneer Venus spacecraft primary and backup operational modes and operational limitations for maneuvers, roll references transfer, attitude determination, spacecraft power discipline and spacecraft thermal discipline, are described. The functions and operations of the large and small probes, as well detailed performance in the normal operating modes and backup modes are presented. S.L.

N82-12090*# Hughes Aircraft Co., El Segundo, Calif. Pioneer-Venus System Engineering

PC-402 PIONEER VENUS ORBITER SPACECRAFT MISSION OPERATIONAL CHARACTERISTICS DOCUMENT

F. C. Barker, L. W. Butterworth, R. E. Daniel, R. J. Drean, K. A. Filetti, J. N. Fisher, L. A. Nowak, J. Porzucki, J. O. Salvatore, and G. A. Tadler Feb. 1978 1027 p refs Revised
(Contract NAS2-9366)
(NASA-CR-166260; SCG-86112A) Avail: NTIS HC A99/MF A01 CSCL 22A

The operational characteristics of the Orbiter spacecraft and its subsystems are described. In extensive detail. Description of the nominal phases, system interfaces, and the capabilities and limitations of system level performance are included along with

functional and operational descriptions at the subsystem and unit level the subtleties of nominal operation as well as detailed capabilities and limitations beyond nominal performance are discussed. A command and telemetry logic flow diagram for each subsystem is included. Each diagram encountered along each command signal path into, and each telemetry signal path out of the subsystem. Normal operating modes that correspond to the performance of specific functions at the time of specific events in the mission are also discussed. Principal backup means of performing the normal Orbiter operating modes are included. J.M.S.

N82-12091*# Rockwell International Corp., Downey, Calif. Space Operations and Satellite Systems Div.
SHUTTLE CONSIDERATIONS FOR THE DESIGN OF LARGE SPACE STRUCTURES
J. A. Roebuck, Jr. Nov. 1980 411 p refs
(Contract NAS9-15718)
(NASA-CR-160861; SSD80-0183) Avail: NTIS HC A18/MF A01 CSCL 22A

Shuttle related considerations (constraints and guidelines) are compiled for use by designers of a potential class of large space structures which are transported to orbit and, deployed, fabricated or assembled in space using the Space Shuttle Orbiter. Considerations of all phases of shuttle operations from launch to ground turnaround operations are presented. Design of large space structures includes design of special construction fixtures and support equipment, special stowage cradles or pallets, special checkout maintenance, and monitoring equipment, and planning for packaging into the orbiter of all additional provisions and supplies chargeable to payload. Checklists of design issues, Shuttle capabilities constraints and guidelines, as well as general explanatory material and references to source documents are included. S.L.

N82-12092*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
STUDY TO DEFINE AN APPROACH FOR DEVELOPING A COMPUTER-BASED SYSTEM CAPABLE OF AUTOMATIC, UNATTENDED ASSEMBLY/DISASSEMBLY OF SPACECRAFT, PHASE 1 Final Report, 1 Jun. - 31 Dec. 1980
J. L. Nevins, T. L. DeFazio, D. S. Seltzer, and D. E. Whitney 1981 37 p refs
(Contract NAS5-26187)
(NASA-CR-166740; R-1436) Avail: NTIS HC A03/MF A01 CSCL 22A

The initial set of requirements for additional studies necessary to implement a space-borne, computer-based work system capable of achieving assembly, disassembly, repair, or maintenance in space were developed. The specific functions required of a work system to perform repair and maintenance were discussed. Tasks and relevant technologies were identified and delineated. The interaction of spacecraft design and technology options, including a consideration of the strategic issues of repair versus retrieval-replacement or destruction by removal were considered along with the design tradeoffs for accomplishing each of the options. A concept system design and its accompanying experiment or test plan were discussed. R.J.F.

N82-12093*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANALYSIS OF SPAR 8 SINGLE-AXIS LEVITATION EXPERIMENT
J. E. Rush (Alabama Univ., Huntsville), C. F. Schafer, and R. L. Holland Sep. 1981 65 p refs
(NASA-TM-82447) Avail: NTIS HC A04/MF A01 CSCL 22A

The melting and resolidification of SPAR 8 payload melting and resolidification of a glass specimen from the in a containerless condition and the retrieval and examination of the specimen from the. The absence of container contact was assured by use of a single-axis acoustic levitation system. However, the sample contacted a wire cage after being held without container contact by the acoustic field for only approximately 87 seconds. At this time, the sample was still molten and, therefore, flowed aroung the wire and continued to adhere to it. An analysis of why the sample did not remain levitated free of container contact is presented. The experiment is described, and experimental observations are discussed and analyzed. S.L.

N82-12094*# General Dynamics/Convair, San Diego, Calif. Advanced Space Programs.
SPACE CONSTRUCTION EXPERIMENT DEFINITION STUDY (SCEDS), PART 1. VOLUME 1: EXECUTIVE SUMMARY Final Report
1 Sep. 1981 34 p
(Contract NAS9-16303)
(NASA-CR-167458; GDC-ASP-81-009-Vol-1-Pt-1; DRL-T-1346; DRD-MA-664T) Avail: NTIS HC A03/MF A01 CSCL 22A

Definition was completed on a basic flight experiment which will provide data on the construction of large space systems from the orbiter which could not be practicably obtained from ground tests. Dynamic behavior of a representative large structure was predicted. On-orbit construction operations were studied. Orbiter control during and after construction was investigated. Evolutionary or supplmental flight experiments for the development of augmentation of a basic flight experiment were identified and defined. R.J.F.

N82-12113*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DROP DYNAMICS
D. D. Elleman *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 32-33 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22A

N82-12118*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUSCEPTIBILITY OF MATERIALS PROCESSING EXPERIMENTS TO LOW-LEVEL ACCELERATIONS
Robert J. Naumann *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 63-68 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-12095*# General Dynamics/Convair, San Diego, Calif. Advanced Space Programs.
SPACE CONSTRUCTION EXPERIMENT DEFINITION STUDY (SCEDS), PART 1. VOLUME 2: STUDY RESULTS Final Report
1 Sep. 1981 149 p refs
(Contract NAS9-16303)
(NASA-CR-167432; GDC-ASP-81-010-Vol-2-Pt-1; DRL-T-1346; DRD-MA-664T) Avail: NTIS HC A07/MF A01 CSCL 22B

A basic Space Shuttle flight experiment which will provide needed data on the construction of large space systems from the Orbiter was defined. The predicted dynamic behavior of a representative large structure, on-orbit construction operations, and Orbiter control during and after construction were studied.

Evolutionary or supplemental flight experiments for the development or augmentation of a basic flight experiment were identified and defined. The study was divided into six major tasks with appropriate sub-tasks noted. R.J.F.

N82-12096*# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
THE DYNAMICS AND CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES Semiannual Status Report, 16 May - 15 Nov. 1981
Peter M. Bainum, R. Krishna, V. K. Kumar, and A. S. S. R. Reddy 15 Nov. 1981 26 p refs
(Grant NsG-1414)
(NASA-CR-164982) Avail: NTIS HC A03/MF A01 CSCL 22B

The dynamics and attitude and shape control of very large, inherently flexible spacecraft systems were investigated. Increasingly more complex examples were examined, beginning with a uniform free-free beam, next a free-free uniform plate/platform and finally by considering a thin shallow spherical shell structure in orbit. The effects devices were modeled. For given sets of assumed actuator locations, the controllability of these systems was first established. Control laws for each of the actuators were developed based on decoupling techniques (including distributed modal control) pole placement algorithms and a application of the linear regulator problem for optical control theory. B.W.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-12097* National Aeronautics and Space Administration, Washington, D. C.
THIRD INTELSAT 5 SATELLITE SCHEDULED FOR LAUNCH
27 Nov. 1981 8 p
(NASA-News-Release-81-185; P81-10189) Avail: NASA Scientific and Technical Information Facility, P. O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22B

The launch sequence of the Intelsat 5-C satellite is announced. A brief description of the satellite and the Atlas Centaur launch vehicle is given. Prelaunch operations are included. S.L.

N82-12098 Engins Matra, Velizy (France).
SATELLITE MAINTENANCE IN ORBIT [MAINTENANCE DES SATELLITES EN ORBITE]
Helene Cerbelaud 1981 95 p In FRENCH Sponsored by ESA
Avail: Issuing Activity

Maintenance strategies are outlined, refering to the Brasilsat telecommunications satellite. System reliability is extrapolated from data concerning individual items. By varying parameters such as size, load, working life, etc., satellite optimization is deduced. Choice of maintenance system should be based on cost/benefits ratios, bearing in mind increased survivability which maintenance endows. No specific recommendations are made. Author (ESA)

N82-12099*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AE-5 END OF MISSION TESTS REPORT
Thomas H. Stengle, Fred Kissel (Westinghouse Electric Corp.), J. Schaefer (Westinghouse Electric Corp.), and Ford Kalil Oct. 1981 37 p refs Submitted for publication
(NASA-TM-83845) Avail: NTIS HC A03/MF A01 CSCL 22B

A spin up test and a TDRS tracking simulation were performed on the AE-5 spacecraft before its end of mission. the spin up test showed that the Body Horizon Scanner could be successfully used on other spacecraft with spin rates up to 10 RPM. the TDRS tracking simulation showed that an AE-5 type attitude control system could be successfully used to point the spacecraft towards a TDRS for the purpose of transmitting/relaying data via the TDRS. N.W.

N82-12100# National Aerospace Lab., Tokyo (Japan).
THRUSTER-EXHAUST-PLUME-IMPINGEMENT NCE TORQUE OF THREE-AXIS-STABILIZED SATELLITE
Katsuhisa Koura, Shoichi Tsuda, Katsuyoshi Arai, and Makoto Kajikawa 1981 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-670; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

For a three-axis-stabilized satellite with reaction control thrusters and extended solar paddles, the thruster-exhaust-impingement on the paddle causes a plume impingement disturbance torque. A method of theoretical estimation of the plume torque is established and the PITS (plume-impingement torque simulation software) is produced. The plume torque obtained by the PITS is compared with the plume torque data of the Japanese medium-scale broadcasting satellite (BS). Although the roll torque is in partial disagreement. Since the present theoretical model can reasonably estimate the BS plume torque, the PITS may be available for plume-torque estimation in forthcoming three-axis-stabilized satellites. Author

N82-12101# Ballistic Research Labs., Aberdeen Proving Ground, Md. Ballistic Research Lab.
YAWSONDE TESTS OF 2.75-INCH Mk66 MOD 1 ROCKET Final Report
William H. Mermagen and Vural Oskay Aug. 1981 55 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A104904; ARBRL-MR-03127) Avail: NTIS HC A04/MF A01 CSCL 19/7

The Mk66 Mod 1 is a 2.75-inch rocket which uses three wrap-around fins for flight stabilization and roll control. Performance requirements made it necessary to closely control the spin history of the rocket over its trajectory so as to avoid a resonance region. The BRL performed a small yawsonde test program to measure the roll history and yaw behavior for selected fin configurations. GRA

N82-12102# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Missile Structures Directorate.
HAWK LAUNCHER SHOCK ABSORBER (PART NUMBER 11567877) Final Test Report
John D. Alston Jul. 1981 53 p
(AD-A105384; AD-E950157; DRSMI/RL-81-8-TR) Avail: NTIS HC A04/MF A01 CSCL 16/1

This report summarizes the test methods and results of a series of tests to determine compliance of modified Hawk launcher shock absorbers with Technical Data Package (TDP) requirements. The primary test was a dynamic impact of the shock absorber with a 1000-lb weight traveling at 28 in./sec. The force/time relationship during shock absorber actuation induced by this impact was recorded on an oscillograph and by a digital computer. Correlation of test results was excellent and performance of the shock absorbers was good. There were some areas of noncompliance to the performance requirements of the shock absorber TDP. Author (GRA)

N82-12103# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatial.
ENERGY DISSIPATION IN EXOSAT TANKS: TEST RESULTS
Jean-Louis Marce, Louis Torres, David Assemat (Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Toulouse), and Solange Michel (Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Toulouse) Mar. 1981 117 p refs In ENGLISH; FRENCH summary
(CNES-NT-99) Avail: NTIS HC A06/MF A01

Results of tests performed with inertia ratio and filling ratio scanning on Ariane tanks are presented. The Exosat launch requires the use of a fourth stage (P 0.7). The Exosat + P 0.7 assembly is spin stabilized with a spin rate of 50 rpm during transfer orbit. The unstable assembly is fitted with an active nutation damping system. To size this, it is necessary to know the time constant of nutation build up essentially due to fuel motion in the propane tanks and the hydrazine tank of Exosat. The major source of dissipation is the hydrazine tank for which

an hysteresis phenomenon on diaphragm position was observed; the worst time constants of nutation build up, deduced from tests are 2.5 mn before P 0.7 and 1.9 mn after P 0.7 firing, taking into account the appropriate safety factors. Author (ESA)

N82-12104# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY, NO. 133
27 Oct. 1981 53 p Transl. into ENGLISH from various Chinese articles
(JPRS-79301) Avail: NTIS HC A04/MF A01

Progress in science and technology in the People's Republic of China was reported. The following topics are presented: (1) applied sciences; (2) scientists and scientific organization; (3) publications; (4) communications; (5) genetics; (6) iron and steel technology; (7) telecommunication technology. For individual title, see N82-12105.

N82-12105# Joint Publications Research Service, Arlington, Va.
USE OF SKW-9 SINGLE LAUNCH VEHICLE FOR THREE SATELLITES DESCRIBED
In its China Rept.: Sci. and Technol., No. 133 (JPRS-79301) 27 Oct. 1981 p 6-9 Transl. into ENGLISH from Wen Wei Po (Hong Kong), 25 Sep. 1981 p 2 (For primary document see N82-12104 03-15)
Avail: NTIS HC A04/MF A01

The ninth scientific experimental satellite (SKW-9) launch in the Chinese Peoples Republic is described. One launch vehicle was used to insert three satellites into orbit simultaneously, the one rocket multiple satellite launch technique. The three satellites have different shapes. The heaviest satellite is composed of two frustum shaped sections which emit radiowaves continuously. The lightest satellite is spherically shaped, consisting of a metallic sphere and a balloon connected by a thin wire. The third satellite is the main component of SKW-9. Its shape is an octagonal prism with a diameter of 1.2 m. Its panels convert solar energy into electrical energy to provide power to the electronic instruments aboard the satellite. The SKW-9's mission is to survey the physical properties of the upper atmosphere. E.A.K.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-12106*# Engineering Analysis, Inc., Huntsville, Ala.
ADVANCED SHUTTLE SIMULATION TURBULENCE TAPES (SSTT) USERS GUIDE
Frank B. Tatom and S. Ray Smith 29 Sep. 1981 82 p
(Contract NAS8-33818)
(NASA-CR-161890; EAI-TR-81-003A) Avail: NTIS HC A05/MF A01 CSCL 22B

A nonrecursive model (based on von Karman spectra) for atmospheric turbulence along the flight path of the shuttle orbiter was developed which provides for simulation of instantaneous vertical and horizontal gusts at the vehicle center-of-gravity and also for simulation of instantaneous gust gradients. Based on this model, the time series for both gusts and gust gradients was generated and stored on a series of magnetic tapes which are entitled shuttle simulation turbulence tapes (SSTT). The time series are designed to represent atmospheric turbulence from ground level to an altitude of 120,000 meters. An appropriate description of the characteristics of the simulated turbulence stored on the tapes, as well as instructions regrding their proper use are provided. The characteristics of the turbulence series, including the spectral shape, cutoff frequencies, and variation of turbulence parameters with altitude, are discussed. Information regarding the tapes and their use is presented. Appendices provide results of spectral and statistical analyses of the SSTT and examples of how the SSTT should be used. B.J.F.

N82-12107*# Axiomatix, Los Angeles, Calif.
PAYLOAD/ORBITER SIGNAL-PROCESSING AND DATA-HANDLING SYSTEM EVALUATION Final Report
William E. Teasdale and Andreas Polydoros 22 Dec. 1980 198 p refs
(Contract NAS9-15240G)
(NASA-CR-161007; R8012-5) Avail: NTIS HC A09/MF A01 CSCL 17B

Incompatibilities between orbiter subsystems and payload communication systems to assure that acceptable and to end system performamce will be achieved are identified. The potential incompatabilities are associated with either payloads in the cargo bay or detached payloads communicating with the orbiter via an RF link. The payload signal processing and data handling systems are assessed by investigating interface problems experienced between the inertial upper stage and the orbiter since similar problems are expected for other payloads. S.L.

N82-12108# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Raumfahrt.
POSITION AND HOLD MOUNT. DEMONSTRATION MODEL Final Report
Paris ESA 27 May 1981 94 p refs
(Contract ESA-4059/79/NL-AK)
(ESA-CR(P)-1460) Avail: NTIS HC A05/MF A01

A position hold mount (PHM) demonstration model to test the suitability of the established PHM concept design of a general purpose PHM on Spacelab is described. The data electronics are based on the MUDAS processor and peripheral modules. The power electronics are standard commercial devices. Emergency electronics include a generator for on/off pulses; microswitches for direction indication and stop function mounted on the drive units; power supplies for the motors. The PHM software is for the demonstration phase, so no Spacelab interface software was generated. Test results indicate that the system can be adapted for Spacelab. Author (ESA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-12109*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACECRAFT DYNAMICS AS RELATED TO LABORATORY EXPERIMENTS IN SPACE
G. H. Fichtl, ed., B. N. Antar, ed., and F. G. Collins, ed. Nov. 1981 206 p refs Workshop held in Huntsville, Ala., 1-2 May 1979
(NASA-CP-2199; M-362) Avail: NTIS HC A10/MF A01 CSCL 22B

Proceedings are presented of a conference sponsored by the Physics and Chemistry Experiments in Space Working Group to discuss the scientific and engineering aspects involved in the design and performance of reduced to zero gravity experiments affected by spacecraft environments and dynamics. The dynamics

of drops, geophysical fluids, and superfluid helium are considered as well as two phase flow, combustion, and heat transfer. Interactions between spacecraft motions and the atmospheric cloud physics laboratory experiments are also examined. For individual titles, see N82-12110 through N82-12130.

N82-12110*# National Bureau of Standards, Washington, D.C. Thermophysics Div.

DEFINING CRITICAL POINT EXPERIMENTS FOR A SPACE LABORATORY

Mike R. Moldover *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 11-17 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Three representative low-gravity experiments for a fluid near its liquid-vapor critical point are being defined. Two of these experiments require very careful measurements of properties of the fluid in thermodynamic equilibrium, while the third experiment is a series of optical observations of the phenomena which occur as a fluid is changed from one phase to two phases, either by cooling through the critical point, or by adiabatic expansion. There is concern that residual spacecraft motions may complicate the interpretation of the data from the proposed experiments. It is possible that the Spacelab environment will render certain desirable experiments impractical. A.R.H.

N82-12111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DYNAMICS OF SUPERFLUID HELIUM IN ZERO GRAVITY **c31**

Peter V. Mason *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 18-24 ref (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20L

The Spacelab 2 superfluid helium experiment was designed to: (1) examine the behavior of capillary waves and measure their velocity and dampling; (2) study the sloshing motion of bulk superfluid helium in near-zero gravity in order to determine its effects on sensors and attitude control systems for far infrared telescopes; and (3) determine the temperature distributions in the liquid and their correlation with bulk motion. The experiment system includes a helium cryostat with a sensor head and a microcomputer to provide electrical excitation and gather and transmit resultant responses to the experiment teams on the ground. Astronaut intervention is possible. A.R.H.

N82-12112*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

GEOPHYSICAL FLUID DYNAMICS **c34**

William W. Fowlis *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 25-31 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

Systematic scaling or dimensional analysis reveals that certain scales of geophysical fluid flows (such as stellar, ocean, and planetary atmosphere circulations) can be accurately modeled in the laboratory using a procedure which differs from conventional engineering modeling. Rather than building a model to obtain numbers for a specific design problem, the relative effects of the significant forces are systematically varied in an attempt to deepen understanding of the effects of these forces. Topics covered include: (1) modeling a large-scale planetary atmospheric flow in a rotating cylindrical annulus; (2) achieving a radial dielectric body force; (3) spherical geophysical fluid dynamics experiments for Spacelab flights; (4) measuring flow and temperature; and (5) the possible effect of rotational or precessional disturbances on the flow in the rotating spherical containers. A.R.H.

N82-12113*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DROP DYNAMICS **c12**

D. D. Elleman *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 32-33 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22A

The drop dynamics module is a Spacelab-compatible acoustic positioning and control system for conducting drop dynamics experiments in space. It consists basically of a chamber, a drop injector system, an acoustic positioning system, and a data collection system. The principal means of collecting data is by a cinegraphic camera. The drop is positioned in the center of the chamber by forces created by standing acoustic waves generated in the nearly cubical chamber (about 12 cm on a side). The drop can be spun or oscillated up to fission by varying the phse and amplitude of the acoustic waves. The system is designed to perform its experiments unattended, except for start-up and shutdown events and other unique events that require the attention of the Spacelab payload specialist. A.R.H.

N82-12114*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INTERACTIONS BETWEEN SPACECRAFT MOTIONS AND THE ATMOSPHERIC CLOUD PHYSICS LABORATORY EXPERIMENTS

B. J. Anderson *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 34-35 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

In evaluating the effects of spacecraft motions on atmospheric cloud physics laboratory (ACPL) experimentation, the motions of concern are those which will result in the movement of the fluid or cloud particles within the experiment chambers. Of the various vehicle motions and residual forces which can and will occur, three types appear most likely to damage the experimental results: non-steady rotations through a large angle, long-duration accelerations in a constant direction, and vibrations. During the ACPL ice crystal growth experiments, the crystals are suspended near the end of a long fiber (20 cm long by 200 micron diameter) of glass or similar material. Small vibrations of the supported end of the fiber could cause extensive motions of the ice crystal, if care is not taken to avoid this problem. A.R.H.

N82-12115*# State Univ. of New York at Stony Brook.

COMBUSTION EXPERIMENTS IN SPACE **c25**

A. L. Berlad *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 36-42 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 21B

Pivotal areas for needed combustion observations (available through space shuttle experimentation) include: (1) single- and two-phase premixed flame propagation and extinction limits; (2) noncoherent flame propagation and extinction; (3) autoignition of premixed single-phase and two-phase combustible reactants; (4) upper pressure limit combustion phenomena and ignition, propagation, and extinction processes in the neighborhood of such limits; (5) oscillatory combustion associated with the hydrocarbon-oxygen and with the carbon monoxide-oxygen systems; (6) two-phase flame spread and extinction involving lage liquid-gas or solid-gas interfaces; (7) radiative ignition of solids and liquids; (8) pool burning; (9) smoldering of solid combustibles and the associated transition to flaming or extinction; (10) laminar gas jet combustion; and (11) transient responses of combustible systems to time variation in gravitational field strengths. A number of these may be impacted by undesirably high g-jitter effects. A.R.H.

N82-12116*# Tennessee Univ. Space Inst., Tullahoma.

TWO-PHASE FLOW AND HEAT TRANSFER UNDER LOW GRAVITY **c34**

Walter Frost *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 43-57 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

Spacelab experiment to investigate two-phase flow patterns under gravity uses a water-air mixture experiment. Air and water are circulated through the system. The quality or the mixture or air-water is controlled. Photographs of the test section are made and at the same time pressure drop across the test section is measured. The data establishes a flow regime map under reduced gravity conditions with corresponding pressure drop correlations. The test section is also equipped with an electrical resistance heater in order to allow a flow boiling experiment to be carried out using Freon II. High-speed photographs of the test section are used to determine flow patterns. The temperature gradient and pressure drop along the duct can be measured. Thus, quality change can be measured, and heat transfer calculated. A.R.H.

N82-12117*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRIBOLOGY EXPERIMENT **c37**
William A. Wall *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 58-60 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20K

A two-dimensional concept for Spacelab rack 7 was developed to study the interaction of liquid lubricants and surfaces under static and dynamic conditions in a low-gravity environment fluid wetting and spreading experiments of a journal bearing experiments, and means to accurately measure and record the low-gravity environment during experimentation are planned. The wetting and spreading process of selected commercial lubricants on representative surface are to the observes in a near-zero gravity environment. A.R.H.

N82-12118*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUSCEPTIBILITY OF MATERIALS PROCESSING EXPERIMENTS TO LOW-LEVEL ACCELERATIONS **c12**
Robert J. Naumann *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 63-68 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22A

The types of material processing experiments being considered for shuttle can be grouped into four categories: (1) contained solidification experiment; (2) quasicontainerless experiments; (3) containerless experiments; and (4) fluids experiments. Low level steady acceleration, compensated and uncompensated transient accelerations, and rotation induced flow factors that must be considered in the acceleration environment of a space vehicle whose importance depends on the type of experiment being performed. Some control of these factors may be exercised by the location and orientation of the experiment relative to shuttle and by the orbit vehicle attitude chosen for mission. The effects of the various residual accelerations can have serious consequence to the control of the experiment and must be factored into the design and operation of the apparatus. A.R.H.

N82-12119*# Case Western Reserve Univ., Cleveland, Ohio.
CONVECTION IN FLUIDS AT REDUCED GRAVITY **c34**
Simon Ostrach *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 89-95 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

Natural convection is not always harmful and, therefore, to be avoided. In some situations it may be desirable to have fluid flows in space processes, e.g., to stir the fluid phase for mixing and cooling or to help maintain concentration gradients. In may event, it is important to know the extent and nature of convection in space and the factors on which it depends, in order either to minimize the effects to convection, or to utilize the convection to advantage. The information needed to assess both conventional and unstable convection includes: (1) the magnitude and direction of accelerations; (2) gometric configuration; (3) imposed boundary conditions; and (4) material properties. A.R.H.

N82-12120*# Rochester Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.
EFFECTS OF SPACECRAFT MOTIONS ON FLUIDS EXPERIMENTS **c34**
Roger F. Gans *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 96-102 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

The equations of motion governing an incompressible fluid contained in an orbiting laboratory were examined to isolate various fictitious forces and their relative influence on the fluid. The forces are divided into those arising from the orbital motions and those arising from small local motions of the spacecraft about its center of mass. The latter dominate the nonrotating experiments. Both are important for rotating experiments. A brief discussion of the onset of time-dependence and violent instability in earth-based rotating and precesssing systems is given. T.M.

N82-12121*# National Aeronautics and Space Administration, Washington, D. C.
TRANSIENT THERMAL CONVECTION IN MICROGRAVITY **c34**
Robert F. Dressler *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 103-112 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

The unsteady two-dimensional thermal convection in a cylinder due to a transient acceleration solved for a step-function excitation. From this, the solution was obtained for an arbitrary time-dependent acceleration. The solutions are valied for sufficiently low Rayleigh numbers and therefore, relevant to microgravity fields. As an example, two graphs are presented for he convection resulting from the movement of an astronaut inside the Shuttle. The analysis can be applied to obtain any other convective flows such as those caused by g-jitter or variable rotation of the Shuttle. T.M.

N82-12122*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACECRAFT DYNAMIC ENVIRONMENTS
George H. Fichtl *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 115-120 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Zero-gravity conditions in Earth orbit cannot be obtained in the Shuttle Orbiter, however, through careful planning, the dynamic environment and its effects on experiments can be minimized. Futhermore, although the dynamic environment of the Shuttle Orbiter is to a large degree stochastics, it is possible to predict characteristics of this environments so that scientists and technologists can plan their experiments and mission managers can plan missions with a view toward minimizing the effects of spacecraft dynamics on experiments. Characteristics of the dynamic environment that might be predicted include typical and 'worst case' values of vehicle acceleration for the anticipated acceleration sources, typical number of acceleration event, duration times of disctete acceleration events, bandwidth of acceleration time history, etc. T.M.

N82-12123*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ORBITAL ENVIRONMENT DYNAMICS
Robert E. Smith *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 121-128 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Diurnal density variatios of the upper atmosphere are described. Temperature distribution above the thermopause were mapped and extremes of temperature variation over the 11-year solar cycle were determined. Day and nigth density profiles in the upper atmosphere at sunspot minimum and at a time of exceptionally high solar activity are presented. T.M.

N82-12124*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONTRIBUTIONS OF ORBITAL MECHANICS TO CONDUCTING EXPERIMENTS IN SPACE
Larry D. Mullins *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 129-136 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Orbital mechanics as a discipline is principally concerned with solving the set of equations for analyzing the motion of a satellite under various conditions. This activity on the surface may not seem crucial to conducting experiments in space, but it provides insights into the way in which forces may influence these experiments. More directly, for experiments concerned with external targets, it provides predictions of the satellites's position and velcoity verus time, enabling extensive preflight planning and resulting in optimum use of on-orbit time. Author

N82-12125*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DYNAMIC BEHAVIOR OF PARTICLES IN SPACECRAFT
Barton S. Perrine *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 137-146 refs (For primary

document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

The behavior of particles relative to a spacecraft frame of reference was examined. Significant spatial excursions of particles in space can occur relative to the spacecraft frame of reference as a result of drag deceleration of the vehicle. These vehicle excursions tend to be large as time increases. Thus, if the particle is required to remain in a specified volume, constraints may be required. Thus, for example, in levitation experiments it may be extremely difficult to turn off the forces of constraint which keep the particles in a specified region. This means experiments which are sensitive to disturbances may be very difficult to perform if perturbation forces are required to be absent. T.M.

N82-12126*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
DESIGN OF THE SPACE SHUTTLE DIGITAL AUTOPILOT AND RESULTING DYNAMIC ENVIRONMENT
Stanley Fay *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 147-166 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

This compilation progresses through the development of the Space Shuttle phase plane controller form fundamental considerations. Quantitative insight regarding the nature of the dynamic environment aboard the Shuttle is provided. T.M.

N82-12127*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EXCEEDANCE STATISTICS OF ACCELERATIONS RESULTING FROM THRUSTER FIRINGS ON THE APOLLO-SOYUZ MISSION
George H. Fichtl and Robert L. Holland *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 167-174 ref (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Spacecraft acceleration resulting from firings of vernier control system thrusters is an important consideration in the design, planning, execution and post-flight analysis of laboratory experiments in space. In particular, scientists and technologists involved with the development of experiments to be performed in space in many instances required statistical information on the magnitude and rate of occurrence of spacecraft accelerations. Typically, these accelerations are stochastic in nature, so that it is useful to characterize these accelerations in statistical terms. Statistics of spacecraft accelerations are summarized. T.M.

N82-12128*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELASTIC BODY DYNAMICS
Ben W. Holder *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 175-180 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

Most of the structural dynamics resources allocated to the Space Shuttle are concentrated on the flight events which result in critical structural loads and/or minimum control stability margins. Since these events are primarily sub-orbital, the data base of interest to those involved in orbital experimentation is somewhat limited. A brief discussion of available data is given. Although estimates of peak acceleration levels and the associated frequency spectrum in the payload bay due to thrusting of the various control system thrusters were made, the actual levels and time histories must be based on updated structural math models and a detailed knowledge of the input forcing functions. T.M.

N82-12129*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CREW ACTIVITIES IN SPACE **c54**
Guion S. Bluford, Jr. *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 181-187 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 05H

One of the mission requirements of the Space Shuttle is to serve as a working platform for experiments in space. Many of these experiments will be performed by crewmembers (mission specialists and payload specialists) in a general purpose laboratory called Spacelab. All nonexperiment-related activities or housekeeping activities will be done in the Orbiter, while most of the mission-related activities (experiments) will be done in Spacelab. In order for experimenters to design their experiments to best utilize the capabilities of the Orbiter, the Spacelab, and the crew, the working environment in the Orbiter and in Spacelab is described. In addition, the housekeeping activities required of the crew are summarized. T.M.

N82-12130*# Martin Marietta Corp., Denver, Colo.
ACOUSTIC AND VIBRATION ENVIRONMENTS FOR LABORATORY EXPERIMENTS IN SPACE
W. P. Rader *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 188-195 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 22B

The basic parameters of random noise and vibration are described, and typical environments for the launch phase and orbital operations are presented. For the latter, both acoustically induced and structure-borne, thruster-included vibration are addressed, using data obtained during the Skylab and Titan programs. T.M.

N82-12131*# Astro Research Corp., Carpinteria, Calif.
CRITICAL REQUIREMENTS FOR THE DESIGN OF LARGE SPACE STRUCTURES Final Report
John M. Hedgepeth Washington NASA Nov. 1981 50 p refs
(Contract NAS1-15347)
(NASA-CR-3484; ARC-R-1016) Avail: NTIS HC A03/MF A01 CSCL 22B

The design criteria for large space structures are studied. Critical baseline design requirements for general types of structures are identified by a series of rational parametric analyses. Requirements imposed by operational loads, stiffness, and structural-control interactions are addressed along with deformations, precision and member slenderness criteria. Examples of applications of the identified loads and criteria to the design of the spacecraft structures discussed include: truss antenna reflectors, interorbit propulsion loads, and free-flying solar reflectors. S.L.

N82-12132# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
QUALIFICATION VIBRATION TEST REPORT FOR SD 802 MATERIALS EXPERIMENT
A. F. DiGiacomo 3 Aug. 1981 41 p refs
(Contract F04701-80-C-0081)
(AD-A105321; TR-0081(6950-05)-3; SD-TR-81-58) Avail: NTIS HC A03/MF A01 CSCL 22/2

The qualification vibration tests conducted for SD 802 Spacecraft Materials Experiment Hardware, NASA Experiment No. M0003, are described. These tests were performed to demonstrate the structural integrity of the experiment modules when mounted in flight configuration. Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-12133*# Hughes Research Labs., Malibu, Calif. Ion Physics Dept.

RETROFIT AND ACCEPTANCE TEST OF 30-cm ION THRUSTERS Final Report, 12 Apr. 1978 - 1 Apr. 1981

R.. L. Poeschel Jun. 1981 324 p

(Contract NAS3-21357)

(NASA-CR-165259) Avail: NTIS HC A14/MF A01 CSCL 21C

Six 30 cm mercury thrusters were modified to the J-series design and evaluated using standardized test procedures. The thruster performance meets the design objectives (lifetime objective requires verification), and documentation (drawings, etc.) for the design is completed and upgraded. The etrofit modifications are described and the test data for the modifications are presented and discussed. S.L.

N82-12134# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.

APPLICATION OF THE THREE BEAM LASER CROSS CORRELATION TECHNIQUE IN THE EXHAUST PLUME OF A LIQUID FUELLED ROCKET MOTOR

G. J. Ball May 1981 38 p refs

(Contract AT/2040/084/XP)

(AASU-343) Avail: NTIS HC A03/MF A01

A method for acquiring data in order to validate computer predictions of radial profiles of rms density fluctuations is presented. The three beam laser cross correlation technique was used to measure radial profiles of rms density fluctuation in a liquid fuelled rocket motor. The measured values are in close agreement with computer predicted profiles. A detailed error analysis is presented which indicates that fundamental limitations on the accuracy of the technique are set by practical motor burn times and the power spectrum of the fluctuating density field. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-12135*# Ultrasystems, Inc., Irvine, Calif.

THERMAL OXIDATIVE DEGRADATION REACTIONS OF PERFLUOROALKYLETHERS Final Report, Sep. 1980 - Sep. 1981

K. L. Paciorek, T. I. Ito, and R. H. Kratzer Oct. 1981 46 p refs

(Contract NAS3-22517)

(NASA-CR-165516; SN-1020-A1-F) Avail: NTIS HC A03/MF A01 CSCL 07C

The mechanisms operative in thermal oxidative degradation of Fomblin Z and hexafluoropropene oxide derived fluids and the effect of alloys and additives upon these processes are investigated. The nature of arrangements responsible for the inherent thermal oxidative instability of the Fomblin Z fluids is not established. It was determined that this behavior is not associated with hydrogen end groups or peroxy linkages. The degradation rate of these fluids at elevated temperatures in oxidizing atmospheres is dependent on the surface/volume ratio. Once a limiting ratio is reached, a steady rate appears to be attained. Based on elemental analysis and oxygen consumption data, $CF_2OCF_2CF_2O_2$, no. CF_2CF_2O, is one of the major arrangements present. The action of the M-50 and Ti(4 Al, 4 Mn) alloys is much more drastic in the case of Fomblin Z fluids than that observed for the hexafluoropropene derived materials. The effectiveness of antioxidation anticorrosion additives, P-3 and phospha-s-triazine, in the presence of metal alloys is very limited at 316 C; at 288 C the additives arrested almost completely the fluid degradation. The phospha-s-triazine appears to be at least twice as effective as the P-3 compound; it also protected the coupon better. The Ti(4 Al, 4 Mn) alloy degraded the fluid mainly by chain scission processes this takes place to a much lesser degree with M-50. S.L.

N82-12136# Texas A&M Univ., College Station. Dept. of Chemistry.

REACTIONS OF TRIBUTYLSTANNYL ANIONIODS WITH ALKYL BROMIDES

Martin Newcomb and Michael G. Smith 28 Sep. 1981 23 p refs Submitted for publication

(Contract N00014-79-C-0584; Grant NSF CHE-78-27411; NR Proj. 053-714)

(AD-A105433; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/3

The reactions of tributylstannyl anionoids (Bu3SnM, M = Li, K, Cs) with alkyl bromides have been studied. Tributylstannylpotassium and -cesium were prepared by deprotonation of tributyltin hydride with the mixed deprotonating agents potassium (cesium) diisopropylamide/lithium tert-butoxide. The predominant mechanism for alkylation of tributylstannyl anionoids by primary bromides is an S(N)2 displacement or its mechanistic equivalent, but the reactions of tributylstannyllithium with two secondary bromides appear to involve free radicals as intermediates. Dicyclohexylphosphine, which serves as a trapping agent for intermediate free radicals, was found to react relatively slowly with tributylstannyllithium to give hexabutylditin. GRA

N82-12137# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

METALS AND CERAMICS DIVISION MATERIALS SCIENCE PROGRAM Annual Progress Report, period ending 30 Jun. 1981

C. J. McHargue, comp. and Sigfred Peterson, ed. Sep. 1981 273 p refs

(Contract W-7405-eng-26)

(DE81-030697; ORNL/TM-7970) Avail: NTIS HC A12/MF A01

Information is presented concerning the theoretical studies of metals and alloys; X-ray diffraction research; structural ceramics; structure of coal; analytical and high-voltage electron microscopy; deformation and mechanical properties; mechanisms of surface and solid-state reactions; physical properties research; metastable materials; neutron radiation effects; charged particle radiation effects; theory and modeling of radiation effects; facility and advanced technique development; fundamentals of welding and joining; and studies in nondestructive evaluation. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N82-12138# National Aerospace Lab., Tokyo (Japan).

STRENGTH EVALUATION TEST OF HOT-PRESSED SILICON NITRIDE AT ROOM TEMPERATURE

Katsutoshi Matsusue, Kitao Takahara, and Ryosaku Hashimoto 1981 26 p refs In JAPANESE; ENGLISH summary

(NAL-TR-676; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

In order to study strength characteristics at room temperature and the strength evaluating-method of ceramic materials, bending-tests of bars, tensile tests of rectangular plates and spin-tests of disks with a hole in the center were conducted on hot-pressed Si_3N_4 specimens. The mean strengths of the specimens as shown by either the tensile or the spin tests, agreed well with the values predicted from the results of the mean strength and the Weibull's modules by bending-tests of the material and the effective volume. The mean strength generally decreased with increasing effective volumes of the specimens when said effective volumes were not very small. However, they approached a certain value independent of the effective volumes when they were small enough. The limit value of the effective

volumes was about 1 cm mm. Spin-testing was shown to be a useful method of testing the strength of ceramics. Observations of the fracture origins and of propagation on the fracture surfaces were made. When the effective volumes were large as in the case of spin-testing, two or more fracture origins were sometimes observed. Locations of the fracture origins did not necessarily coincide with that site where maximum stress was predicted to occur, and the discrepancies between the actual and predicted sites were generally great when stress-gradients on the fracture surface were small. B.W.

N82-12139*# Composites Horizons, Pomona, Calif.
HYBRIDIZED POLYMER MATRIX COMPOSITE Final Report
Bruce A. Stern and Teunis Visser Sep. 1981 85 p refs
(Contract NAS3-21384)
(NASA-CR-165340) Avail: NTIS HC A05/MF A01 CSCL 11D

Under certain conditions of combined fire and impact, graphite fibers are released to the atmosphere by graphite fiber composites. The retention of graphite fibers in these situations is investigated. Hybrid combinations of graphite tape and cloth, glass cloth, and resin additives are studied with resin systems. Polyimide resins form the most resistant composites and resins based on simple novolac epoxies the least resistant of those tested. Great improvement in the containment of the fibers is obtained in using graphite/glass hybrids, and nearly complete prevention of individual fiber release is made possible by the use of resin additives. S.L.

N82-12140*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECT OF RESIN ON THE IMPACT DAMAGE TOLERANCE OF GRAPHITE-EPOXY LAMINATES
Jerry G. Williams and Marvin D. Rhodes Oct. 1981 46 p refs Presented at the 6th ASTM Conf. on Composite Mater.: Testing and Design, Phoenix, Ariz., May 1981
(NASA-TM-83213) Avail: NTIS HC A03/MF A01 CSCL 11D

The effect of the matrix resin on the impact damage tolerance of graphite-epoxy composite laminates was investigated. The materials were evaluated on the basis of the damage incurred due to local impact and on their ability to retain compression strength in the presence of impact damage. Twenty-four different resin systems were evaluated. Five of the systems demonstrated substantial improvements compared to the baseline system including retention of compression strength in the presence of impact damage. Examination of the neat resin mechanical properties indicates the resin tensile properties influence significantly the laminate damage tolerance and that improvements in laminate damage tolerance are not necessarily made at the expense of room temperature mechanical properties. Preliminary results indicate a resin volume fraction on the order of 40 percent or greater may be required to permit the plastic flow between fibers necessary for improved damage tolerance. B.W.

N82-12141*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BIAXIAL TESTS OF FLAT GRAPHITE/EPOXY LAMINATES Final Report, 1 Feb. 1976 - 31 Dec. 1980
Harold Liebowitz and Douglas L. Jones Oct. 1981 106 p refs
(Grant NsG-1289)
(NASA-CR-165793) Avail: NTIS HC A06/MF A01 CSCL 11D

The influence of biaxially applied loads on the strength of composite materials containing holes was analyzed. The analysis was performed through the development of a three dimensional, finite element computer program that is capable of evaluating fiber breakage, delamination, and matrix failure. Realistic failure criteria were established for each of the failure modes, and the influence of biaxial loading on damage accumulation under monotonically increasing loading was examined in detail. Both static and fatigue testing of specially designed biaxial specimens containing central holes were performed. Static tests were performed to obtain an understanding of the influence of biaxial loads on the fracture strength of composite materials and to provide correlation with the analytical predictions. The predicted distributions and types of damage are in reasonable agreement with the experimental results. A number of fatigue tests were performed to determine the influence of cyclic biaxial loads on the fatigue life and residual strength of several composite laminates. B.W.

N82-12142*# Boeing Commercial Airplane Co., Seattle, Wash.
IN-SERVICE INSPECTION METHODS FOR GRAPHITE-EPOXY STRUCTURES ON COMMERCIAL TRANSPORT AIRCRAFT Final Report
M. L. Phelps Nov. 1981 105 p refs
(Contract NAS1-15304)
(NASA-CR-165746) Avail: NTIS HC A06/MF A01 CSCL 11D

In-service inspection methods for graphite-epoxy composite structures on commercial transport aircraft are determined. Graphite/epoxy structures, service incurred defects, current inspection practices and concerns of the airline and manufacturers, and other related information were determind by survey. Based on this information, applicable inspection nondestructive inspection methods are evaluated and inspection techniques determined. Technology is developed primarily in eddy current inspection. S.L.

N82-12143# McDonnell Aircraft Co., St. Louis, Mo.
EFFECT OF FIGHTER ATTACK SPECTRUM ON COMPOSITE FATIGUE LIFE Final Report, Sep. 1978 - Oct. 1980
R. Badaliance and H. D. Dill Mar. 1981 126 p refs
(Contract F33615-78-C-3218; AF Proj. 2401)
(AD-A105034; AFWAL-TR-81-3001) Avail: NTIS HC A07/MF A01 CSCL 11/4

The objective was to evaluate the effect of fighter wing load spectrum variations on the life behavior of composite structures. Six types of spectra were generated: (a) clipping to 90% test limit stress, (b) addition of stress overloads, (c) addition of low loads, (d) truncation to 70% test limit stress, (e) clipping of tension loads, (f) increased severity and number of air-to-air loads. A single hole compression test specimen was designed to simulate fatigue critical areas of fighter wing skins. GRA

N82-12144# Mississippi Univ., University. Dept. of Electrical Engineering.
ELECTROMAGNETIC DIFFRACTION BY A NARROW SLIT IN AN IMPEDANCE SHEET-E-POLARIZATION Final Report
Donald F. Hanson 24 Jul. 1981 65 p refs
(Grant AF-AFOSR-0172-80; AF Proj. 2301)
(AD-A105029; AFOSR-81-0645TR) Avail: NTIS HC A04/MF A01 CSCL 11/4

Composite materials have come into use lately in aircraft construction because of their high strength and low weight. This report examines a method for computing the shielding effectiveness of a narrow slit in a composite material. This corresponds to a joint or seam between two composite panels. For low frequency incident fields, the composite can be effectively modelled as an infinitely thin impedance sheet. The literature on impedance sheets is reviewed and a general integral equation formulation for impedance sheets is described. Since only narrow slits (seams) are of practical interest, a quasi-static (low frequency) approach is developed. A dual integral equation is derived for the problem. The dual integral equation is reduced to a Fredholm second kind integral equation. This integral equation is solved by expanding the unknown in terms of Legendre polynomials. An analytic solution for the problem of a narrow slit in a perfectly conducting plane is also obtained. GRA

N82-12145# Universal Energy Systems, Inc., Dayton, Ohio.
RADIO SHACK TRS-80 POCKET COMPUTER SOLUTIONS TO COMPOSITE MATERIALS FORMULAS Final Report, Jan. - May 1981
Won J. Park Aug. 1981 26 p refs
(Contract F33615-79-C-5125)
(AD-A105173; AFWAL-TR-81-4074) Avail: NTIS HC A03/MF A01 CSCL 11/4

This volume contains the description and instructions of the use of Radio Shack TRS-80 Pocket Computer for the key calculations of the stiffness and strength of symmetric laminated composites. The magnetic cassette tapes contain the required

programming in the language of BASIC. With the aid of tape recorder for loading the program into TRS-80, instant calculation can be made for practical use. The formulas and equation numbers used in the programming have been derived in a book entitled, Introduction to Composite Materials, coauthored by S. W. Tsai and H. T. Hahn, published by Technomic Publishing Company, Westport, CT, July 1980. GRA

N82-12146# Battelle Inst., Frankfurt am Main (West Germany). Haupabt. Materialtechnologie.
RESEARCH AND DEVELOPMENT WORK CONCERNING A FIBER REINFORCED PLASTIC MATERIAL WHICH IS ISOELASTIC TO BONE Final Report
Eva Poeschel, Kari Koester-Loesche, Harald Ehard, Johann Kubicek, Heinrich Deibig, Ulrich Mueller, and Ulrich Roth Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 84 p refs In GERMAN; ENGLISH summary Original contains color illustrations Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-063; R-63.436-9; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,70

A material used for endoprothesis, whose biomechanical properties allow it to adapt to prevailing stress conditions, is presented. A fiber reinforced plastic, adaptable to the specific loading conditions of the bone with the aid of its anisotropic mechanical properties, is applied. Polymethylmethacrylate reinforced with carbon fibers, glass fibers, or a combination of both, proves suitable. According to the present state of development and knowledge, these materials exhibit good biocompatibility and are suitable for medium loads in optimized form. Further investigations are required for application under conditions of extreme stress. Author (ESA)

N82-12147# Technical Research Centre of Finland, Espoo. Poltto-ja Voiteluainelab.
SIGNIFICANCE OF MICROPORES IN ESTIMATING ADSORPTION PROPERTIES OF ACTIVATED CARBON
Jussi Ranta May 1981 120 p refs In FINNISH; ENGLISH summary
(VTT-39; ISBN-951-38-1197-2; ISSN-0355-3590) Avail: NTIS HC A06/MF A01

Literature on the pore structure and the micropore structure of activated carbon is reviewed. Classical research methods based on Kelvin's equation are still most generally used, although reliable information is obtained only about larger pores. In micropore research, a method based on Dubinin's equation determines the total volume and mean size. These parameters are of central significance in the adsorption from steam or gas phases. The determination of micropore parametres with the aid of nitrogen adsorption is studied. Owing to the strong adsorbability, adsorption into larger pores also occurs simultaneously, and is considered when calculating properties of micropores. The dependence of adsorption from liquid phases on the micropore parameters of activated carbon was studied in part with the aid of water solutions of partly water soluble organic materials. The limit volume of micropores is essential. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-12148 Iowa State Univ. of Science and Technology, Ames.
APPLICATIONS OF VIBRATING WIRE ELECTRODES TO ELECTROANALYSIS Ph.D. Thesis
Kenneth W. Pratt, Jr. 1981 290 p
Avail: Univ. Microfilms Order No. 8122556

The design and construction of Au and Pt vibrating electrodes are described. These electrodes were vibrated by means of a loudspeaker at peak to peak amplitudes from 0 to 3.3 mm and frequencies from 30 to 510 Hz. Electronic intrumentation is described which permitted direct recording of the limiting current as a function of the vibrational amplitude. This instrumentation was also used to effect hydrodynamic modulation at the vibrating electrode, with phase selective detection of the resultant 10 Hz alternating component of the electrode current. The hydrodynamic behavior of vibrating electrodes was studied visually and electrochemically. Hydrodynamic transitions in the flow patterns induced by the vibrating electrodes were characterized. The exponential dependencies of the limiting current on the vibrational parameters were determined. Dissert. Abstr.

N82-12149 Iowa State Univ. of Science and Technology, Ames.
TUBULAR ELECTRODES IN FLOW INJECTION ANALYSIS Ph.D. Thesis
Peter Lawrence Meschi 1981 210 p
Avail: Univ. Microfilms Order No. 8122540

Equations describing the current-time response of the electrode, i(t) the maximum of the current-time curve, i sub p and the area under the current-time curve, Q sub p, are derived as a function of the volume of the sample, V sub s, the volume of the flow system, V sub r the flow rate of the fluid stream, V sub s, the coefficient of dispersion, K and the steady-state current, I sub s for the dispersion of a sample in a straight tube under the conditions of laminar flow. The steady-state behavior of the tubular electrode is also described and the validity of the concept of a flow-rate independent component of the steady-state is brought into serious question. The concept was originally proposed to explain the nonzero intercepts obtained for linear extrapolations of plots of V sub f (1/3). The nonzero intercepts are concluded to be mathematical artifacts of inaccurate data analysis rather than the results of an electrochemical phenomenon.
Dissert. Abstr.

N82-12150 Rensselaer Polytechnic Inst., Troy, N. Y.
ANALYSIS FOR ORGANIC PIGMENTS USING SOLUTION SPECTROPHOTOMETRY Ph.D. Thesis
Romesh Kumar 1981 219 p
Avail: Univ. Microfilms Order No. 8121151

Simple analytical schemes and standard reference data were developed for the identification of organic pigments by solution spectrophotometry. This technique involves extraction of the pigment in a suitable solvent and the measurement of the resulting solution on an analytical spectrophotometer (380-900 nanometers) followed by the comparison of the solution spectrum with the spectra of known pigments. The solution spectra were obtained as log absorbance vs wavelengths displays because of the independence of the curve shape of the concentration of the solution. Samples such as oil paints, acrylic paints, inks and plastics containing single and mixed pigments were analyzed successfully. A solvent-extraction and separation scheme was also developed for the identification of natural organic colorants used in old paintings. Organic pigments used in some painting samples and postage stamps were also identified. Dissert. Abstr.

N82-12151 Iowa State Univ. of Science and Technology, Ames.
LASER EXCITED SHPOL'SKII SPECTROSCOPY FOR THE SELECTIVE EXCITATION AND DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS Ph.D. Thesis
Yen Yang 1981 131 p
Avail: Univ. Microfilms Order No. 8122572

An excimer laser pumped, dye-laser coupled with gated detection was employed in the LESS system. The sharp absorption bandwidth exhibited PAHs in Shpol'skii hosts (n-alkanes) at 15 K facilitated the selective excitation and sensitive detection of the luminescence through narrow band laser excitation. It was shown that LESS is capable of distinguishing between structural isomers was well as alkyated substitutional isomers when these occurred in complex mixtures. Luminescence spectra, site population dependency on concentrations, anaytical curves, and detection limits were studied. It was found that: reproducible site population of PAHs at concentration levels below one ppm could be achieved through reproducible cooling regimes; self-absorption of the 0-0 fluorescence lines could be alleviated on excitation with reduced laser power; analytical calibration curves were linear over 3.5 decades in concentration; and detection limits were on the order of parts-per-trillion. Dissert. Abstr.

N82-12152 Iowa State Univ. of Science and Technology, Ames.
THE KINETICS OF THE REVERSE DEACON REACTION Ph.D. Thesis
Arun K. Nanda 1981 153 p
Avail: Univ. Microfilms Order No. 8122546

The kinetics of the chlorination of water vapor at high temperatures were investigated using an eleven-pass glass reactor 4 mm ID and 511 mm long. The rate expression for the reverse Deacon reaction was developed from the experimental data at 879 deg K. Varying the partial pressures of the reactants, the rate data were collected, and these results were synthesized to formulate the rate law. The rate expression was verified by the integral approach and the results were extended to two other temperatures, 777 and 983 deg K. The parameters of the rate expression were obtained by means of a linear-least square fit. The frequency factor and the energy of activation were determined for the reverse Deacon reaction. An attempt was made to verify these parameters with the theoretical values from collision theory and activated complex theory. A mechanism consistent with one of the limiting conditions was postulated. The effects of the flow rates of the reactants and temperature on conversion of chlorine were also examined. Dissert. Abstr.

N82-12153 Toledo Univ., Ohio.
SURFACE CHEMICAL REACTIONS ON STATIONARY OR ROTATING BODIES IN NONISOTHERMAL LAMINAR BOUNDARY LAYER FLOWS Ph.D. Thesis
Ronald Lester Fournier 1981 160 p
Avail: Univ. Microfilms Order No. 8121651

The transport phenomena occurring when species present in an external forced convective flow react according to arbitrary kinetics at the surface of an arbitrary stationary or axisymmetrical rotating body is analyzed. Dissert. Abstr.

N82-12154 Pennsylvania State Univ., University Park.
CARBON-SUPPORTED IRON CATALYSTS FOR CO HYDROGENATION Ph.D. Thesis
Hyun-Jong Jung 1981 304 p
Avail: Univ. Microfilms Order No. 8120442

Carbon blacks, activated carbons, graphitized carbon, and molecular sieve glassy carbons are used to prepare a number of supported iron catalysts. All catalysts are characterized by CO chemisorption and X-ray diffraction measurements to determine average iron crystallite sizes. Magnetization measurements are made on representative samples to estimate metal particle sizes which are compared to the aforementioned values. The catalytic properties of carbon supported iron are then determined for the CO hydrogenation reaction at 101 kPa using a differential, plug flow reactor. Carbon monoxide hydrogenation over iron is a structure sensitive reaction, because of lower surface concentrations of hydrogen on small crystallites caused by inhibited H2 chemisorption. Dissert. Abstr.

N82-12155 Rutgers - The State Univ., New Brunswick, N. J.
FERMENTATION KINETICS AND PROCESS DEVELOPMENT FOR ENHANCED RATE OF PRODUCTION OF ETHANOL FROM CARBOHYDRATES Ph.D. Thesis
Chun-Ko Jin 1981 221 p
Avail: Univ. Microfilms Order No. 8122085

A continuous cascade fermentation process comprising eight tanks in series, employing a protein phosphoipid complex as a protective agent (PA) was performed for ethanol production from glucose. An increase of 58.4% in fermenter productivity was obtained due to the addition of PA. A kinetic model including product and substrate inhibition effects is proposed. Parameters appearing in the kinetic model were estimated by using the method of least squares. It is found that product inhibition effect dominates over the substrate inhibitor system. On the addition of PA, both inhibitor effects are reduced to as little as about one fourth of that without PA. It is also found that the use of PA primarily protects the cells against ethanol inhibition rather than substrate inhibition. A steady state criterion is discussed. Dissert. Abstr.

N82-12156 Arizona Univ., Tucson.
FUEL NITROGEN CONVERSION DURING FUEL RICH COMBUSTION OF PULVERIZED COAL AND CHAR Ph.D. Thesis
James William Glass 1981 334 p
Avail: Univ. Microfilms Order No. 8121921

The conversion of coal and char nitrogen is investigated during fuel rich combustion. The roles of NO, HCN, and NH3, and char nitrogen in the post combustion gases in the first, fuel rich stage of a staged combustor are clarified. The fuel rich conversion of char nitrogen show that at all stoichiometries, the concentrations of HCN and NH3 in the post time gases are small compared to the concentration of NO. Char nitrogen conversion is stoichiometric or greater. Destruction of NO is found to be controlled by a heterogeneous mechanism involving the char carbon surface. The mechanism is deactivated by oxygen. Dissert. Abstr.

N82-12157 New Jersey Inst. of Tech., Newark.
CORRELATION AND PREDICTION OF VAPOR-LIQUID EQUILIBRIUM IN ELECTROLYTIC SOLUTIONS Ph.D. Thesis
Anil Krishna Rastogi 1981 313 p
Avail: Univ. Microfilms Order No. 8121970

Two expressions for the excess Gibbs free energy are presented which correlated and predict vapor-liquid equilibrium and the mean molal activity coefficient of an electrolyte in a ternary mixture containing water and either MeOH of EtOH. The proposed equations take into account coulombic forces between ions and the physical interaction forces between ion-solvent and solvent-solvent molecules in a solution. Dissert. Abstr.

N82-12158 New Jersey Inst. of Tech., Newark.
SEPARATION VIA MULTI-COLUMN pH PARAMETRIC PUMPING Ph.D. Thesis
Wei Tai Yang 1981 218 p
Avail: Univ. Microfilms Order No. 8121973

The study of multi-column pH parametric pumping, a separation technique which applies the principle of parametric pumping and uses pH as control variable is presented. Studies emphasize on the mass transfer and the capability of separation by multi-column pH parametric pumping. A Two-pH Levels Parapump is capable of enriching the product stream with solute components; a Three-pH Levels Parapump is capable of splitting components into two product streams. The separation capability of multi-column parapump is greatly superior to that of single-column parapump. As compared to cycling zone operation, parametric pumping gives a higher separation factor. Hemoglobin and albumin are chosen for the experimental model system to demonstrate the separation capability of multi-column pH parametric pumping, and to verify the predictability of the models. Dissert. Abstr.

N82-12159 Carnegie-Mellon Univ., Pittsburgh, Pa.
ION TRANSPORT IN CHARGED POROUS MEDIA THEORY AND EXPERIMENTS Ph.D. Thesis
Gerald Bruce Westermann-Clark 1981 169 p
Avail: Univ. Microfilms Order No. 8118795

A mathematical model for ion transport in a charged porous medium as well as the results of experiments to test the validity of this model are presented. The Nernst-Planck, Poisson-Boltzmann, and Navier-Stokes equations are used to predict the steady state transport of ions through a circular capillary caused by concentration, pressure and electrical potential differences across the ends of the capillary. The ratio of the capillary radius to the Debye length of the solution inside the capillary and the product of the capillary radius and surface charge density must be known for the model to be solved. The track etched mica system used to test the model has a known number of identical pores in a given membrane, pores whose geometry is very accurately determined, and whose surface charge is the only unknown parameter. Dissert. Abstr.

N82-12160 Lehigh Univ., Bethlehem, Pa.
CONTROL OF HIGH PURITY DISTILLATION COLUMNS Ph.D. Thesis
Carmelo Fuentes 1981 109 p
Avail: Univ. Microfilms Order No. 8118832

The dynamics and control were studied via digital simulation. The effects of product purity, relative volatility, composition analyzer sampling time and magnitude of the disturbance were explored.

Equimolar and non-equimolar overflow systens were considered. Results show that systems with low relative volatility (alpha = 2) respond slowly enough so that good control can be achieved at very high purity levels with a 5 minute dead time in the analyzer. However, systems with high volatility (alpha = 4) respond so quickly that large deviations in products purity occur before the analyzer can respond. The dynamic response of the latter systems is very non linear. Effective control was obtained for these high relative volatility systems by using a composition/temperature cascade system. Dissert. Abstr.

N82-12161 Princeton Univ., N. J.
CRYOGENIC DEPOSITION, DESORPTION, AND REACTION STUDIES OF STRATOSPHERICALLY RELEVANT SPECIES Ph.D. Thesis
Richard Fezza 1981 413 p
Avail: Univ. Microflms Order No. 8121469

The condensing of CF2Cl2, CFCl3, N2, O3, NO, N2O, and CO2, on various cryosurface materials including electropolished, gold-flashed, or hexa-methyldisilazane coated stainless steel disks was investigated. A strong, spurious, first condensation was observed in the 200-250K temperature range for N2O, CO2, NO, CF2Cl2, and CFCl3, with weaker effects for N2 and O2. This phenomenon is believed due to water vapor contamination of the cryosurface, possibly forming a clathrate-like structure with the beam and background species. Desorption spectra for the binary systems CF2Cl2/N2, CF2Cl2/O2, CFCl3/N2, and CFCl3/02, as well as those for the pure components shown carry over of the chlorofluoromethanes at low concentrations by N2 and O2. Temperature programmed and flash desorption techniques revealed a surprising, persistent disproportionation of NO to NO2 during desortion of NO-containing condensates t levels near 50%. Ozone was found to recombine during desorption, exhibiting a threshold concentration effect, and conversion related to absolute quantities of deposits. Dissert. Abstr.

N82-12162 California Univ., Santa Barbara.
DYNAMIC MODELING AND CONTROL STRUCTURES FOR A TUBULAR AUTOTHERMAL REACTOR AT AN UNSTABLE STATE Ph.D. Thesis
Dominique Bonvin 1980 455 p
Avail: Univ. Microfilms Order No. 8120742

A laboratory scale autothermal fixed bed reactor with internal countercurrent heat exchange was operated at a naturally unstable state. Modal control with incomplete state feedback was used; the often difficult task of estimating the unmeasured state variables was purposely avoided. A generalized structural dominance method was developed to determine along with the dominant response modes of the system, the most sensitive state variables and the most effective inputs. The method provides strong guidelines to model reduction. The technique is successfully demonstrated in applications to other large scale systems in addition to the autothermal reactor. A major emphasis is given to the investigation of modal approaches to model reduction, and several techniques were evaluated on a common basis which permits comparisons to be made. Dissert. Abstr.

N82-12163 State Univ. of New York at Buffalo.
BEHAVIOR AND MORPHOLOGY OF PALLADIUM ON ALUMINA MODEL CATALYSTS IN HYDROGEN AND OXYGEN Ph.D. Thesis
James Jenyee Chen 1981 121 p
Avail: Univ. Microfilms Order No. 8122162

The sintering behavior of Pd crystallites supported on gamma alumina in 1 atm flowing hydrogen as a function of time and temperature is studied. Model catalysts consisting of Pd crystallites supported on thin films of alumina are heated at 650 C, 725 C, and 800 C for various time intervals. The same region of a specimen is examined with a transmission electron microscope after each heat treatment to follow the changes of each Pd crystallite. The various events which occur during short, intermediate, and long durations of heating are identified. The possible mechanisms are outlined and discussed. Dissert. Abstr.

N82-12164 Colorado Univ. at Boulder.
STRUCTURE OF LAMINAR PREMIXED FLAMES OF METHANE, METHANOL AND THEIR BLENDS IN OXYGEN Ph.D. Thesis
Habib Ibrahim Abu-Al-Hamayel 1981 145 p
Avail: Univ. Microfilms Order No. 8122264

The overall characteristics of the flames under study were examined. The effect of variation of combustion chamber pressure was observed. The decrease in pressure of the combustion chamber spread the flame zone and better sampling of the combustion gases was possible. Higher temperature profiles were noticed for subatmospheric pressure runs as a result of moving the flame away from the burner surface. The changed of species mole fractions with equivalence ratio is reported. The mole fraction profiles of CO2 mole fraction profile were observed to be minimum for the richest flame for the three fuels. In the attached flame runs, significant product concentrations are found near the burner surface. By increasing the total flow rate of the reactants, the free standing flames were formed and higher fuel concentrations were observed over the prereaction zone. The effect of the fuel structure on the composition profiles was determined.
Dissert. Abstr.

N82-12165 Technische Hogeschool, Delft (Netherlands).
SCALE PREVENTION. STUDY ON THE CRYSTALLIZATION OF CALCIUM SULFATE AND BARIUM SULFATE WITH AND WITHOUT INHIBITORS Ph.D. Thesis
Gerda Maria vanRosmalen 1981 164 p refs
Copyright. Avail: Issuing Activity

Scale formation (precipitation fouling) is defined and its effects on various industrial processes and systems are described. Chemical, physical, and mechanical methods for removing and controlling scale are reviewed with emphasis on the chemical threshold treatment with the addition of trace amounts of inhibitors as well as the use of a fluidized bed. Topics covered include: (1) growth affinity in aqueous solutions; (2) growth kinetics in slightly soluble crystals; (3) growth of calcium sulfate dihydrate crystals in suspension; (4) quantitative description of the influence of the inhibitor concentration on the growth rate; (5) growth of barium sulfate crystals in suspension; (6) influence of the molecular structure of some biosphosphonates on the growth inhibition of barium sulfate crystals in suspension; (7) the influence of various additives at different ph values on the growth rate; and scale inhibition of calcium sulfate by a fluidized bed. A.R.H.

N82-12166* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELECTROPHOTOLYSIS OXIDATION SYSTEM FOR MEASUREMENT OF ORGANIC CONCENTRATION IN WATER Patent
H. Eugene Winkler, inventor (to NASA) Issued 6 Oct. 1981 9 p Filed 21 May 1979 Supersedes N79-23167 (17 - 14, p 1818)
(NASA-Case-MSC-16497-1; US-Patent-4,293,522; US-Patent-Appl-SN-041145; US-Patent-Class-422-80; US-Patent-Class-23-230PC; US-Patent-Class-23-232E; US-Patent-Class-204-1T; US-Patent-Class-204-195S; US-Patent-Class-204-263; US-Patent-Class-204.264; US-Patent-Class-204-266; US-Patent-Class-204-275; US-Patent-Class-204-276; US-Patent-Class-204-278) Avail: US Patent and Trademark Office CSCL 07D

Methods and apparatus for determining organic carbon in aqueous solution are described. The method comprises subjecting the aqueous solution to electrolysis, for generating oxygen from water, and simultaneously to ultraviolet radiation, for oxidation of substantially all organic carbon to carbon dioxide. The carbon dioxide is measured and the value is related to the concentration of organic carbon in the aqueous solution.
Official Gazette of the U.S. Patent and Trademark Office

N82-12167*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
REQUIREMENTS DOCUMENT FOR MINI SYSTEM TEST UNIT
Dominic Garofolo Aug. 1981 16 p
(Contract NAS9-15800)
(NASA-CR-167436; JSC-17634; LEMSCO-17199) Avail: NTIS HC A02/MF A01 CSCL 07D

The mini system test unit (STU) for the Trace Gas Analyzer (TGA) is defined. The interface signals of the components used to implement the STU are also defined. The mini STU is used to support pre-flight ground test operations. The STU indications

of TGA operation (organic and carbon monoxide analyses) and its ability to monitor gas chromatograph and mass spectrometer test signals are included. S.L.

N82-12168*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE EXTINGUISHANT MATERIALS Patent Application
Robert L. Altman, Ludwig A. Mayer (San Jose State Univ.), and Alan C. Ling, inventors (to NASA) (San Jose State Univ.) Filed 3 Nov. 1981 11 p
(NASA-Case-ARC-11252-1; US-Patent-Appl-SN-317977) Avail: NTIS HC A02/MF A01 CSCL 21B

Fire extinguishant materials were developed for extinguishing fires on hot metal surfaces caused by liquid fuels such as jet engine fuels. The composition of the materials is a mixture of a finely divided aluminum compound and alkali metal, stannous or plumbous halide. The aluminum compound may be aluminum hydroxide, alumina or boehmite, but preferably it is an alkali metal dawsonite. The metal halide may be an alkali metal, e.g. potassium iodide, bromide, or chloride, or stannous or plumbous iodide, bormide, or chloride. Potassium iodide is preferred. The presence of the halide improves the performance of the aluminum compound in extinguishing fires on hot metal surfaces. NASA

N82-12169# Technische Hogeschool, Delft (Netherlands).
COPRECIPITATED NICKEL-ALUMINA METHANATION CATALYSTS Ph.D. Thesis
Edgar Charles Kruissink 1981 145 p refs Sponsored by Netherlands Foundation for Chemical Research and Netherlands Organization for the Advancement of Pure Research
Avail: NTIS HC A07/MF A01

Methanation is used in a process which aims at the long distance transport of heat obtained from a nuclear high temperature reactor. Heat is transported by means of a chemical circuit. After transport of the cooled product gas, the energy is regained with high efficiency by exothermic methanation reaction. For the system reforming reaction, suitable catalyst preparation, chemical composition and structure are investigated, as is the characterization of calcined and reduced coprecipitates. Coprecipitated nickel alumina catalysts are studied. S.L.

N82-12170# Helsinki Univ. of Technology, Espoo (Finland). Dept. of Technical Physics.
INVESTIGATIONS AND APPLICATIONS OF POLARIMETRIC AND HIGH RESOLUTION MOESSBAUER SPECTROSCOPY
K. Riski 1981 13 p refs Sponsored by the Academy of Finland
Avail: NTIS HC A02/MF A01

Two special topics of mossbauer spectroscopy were investigated, the use of recoilless gamma radiation in studies of magnetic and electric hyperfine interactions and the use of the very high energy resoluton of the Mossbauer resonance of 67 Zn in small energy shift determinations with special application to the measurement of the gravitational red shift. A density matrix theory was extended to take into account the change of polarization of gamma rays in matter with anisotropic nuclear absorbtion. Isomer shifts and linewidths of ZnO powders were studied. Instruments were built to measure how the red shift depends on the propagation direction of the photon. R.J.F.

N82-12171# National Aerospace Lab., Tokyo (Japan).
COMBUSTION AND EMISSION CHARACTERISTICS OF A MODEL GAS TURBINE COMBUSTOR BURNING LEAN HETEROGENEOUS MIXTURES
Shigeru Hayashi and Hideshi Yamada 1981 21 p refs In JAPANESE; ENGLISH summary
(NAL-TR-666; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Rich, heterogeneous mixtures of kerosine and air were injected into the combustion air using an acoustic atomizer and flames were stablized by means of a swirler. Experiments were made at inlet air temperatures of 450, 550, and 650 K under atmospheric pressure. The overall equivalence ratio ranged from the blow-off limit to unity. The degrees of atomization were varied by changing the feeding rate of the atomizing air. The emission indexes of NOx are compared with those for some simplified model combustors burning homogeneous mixtures and for fuel-rich primary zone combustors burning sprays from conventional pressure atomizers or premixed sprays from a mixing tube. The emission index of NOx at th exit is correlated with the adiabtic flame temperature T sub f. The temperature coefficient is compared with a typical value of 0.0006 for homogenous mixtures. Standard Arrhenius plots of the rate of EI(NOx) versus 1/T sub f give a typical value of 18kcal/mol for the activation energy. The NOx emission decreases with increasing degrees of atomization and mixing, the effect being more significant at higher inlet air temperature. The emission indexs of CO, THC, and NOx at 650 K are 8, 0.003 and 13, respectively, under the highest degree of atomization with a combustion efficiency greater than 99.9% and blow-off velocity of about 60m/sec. J.M.S.

N82-12172# Cornell Univ., Ithaca, N. Y. Dept. of Chemistry.
SECONDARY ION MASS SPECTROMETRIC IMAGE DEPTH PROFILING FOR THREE-DIMENSIONAL ELEMENTAL ANALYSIS Interim Technical Report
Adam J. Patkin and George H. Morrison 1 Oct. 1981 24 p refs
(N00014-80-C-0538)
(AD-A105092; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Three-dimensional elemental microcharacterization of the near-surface regions of solid samples is performed by combining the dynamically eroding nature of secondary ion mass spectrometry (SIMS), spatially resolved multi-area, multi-element ion intensity data, and digital image processing. Multiple simultaneous depth profiles and three-dimensional image profiles are used to analyze a metal-oxide semiconductor (MOS) integrated circuit and ion implant samples. Author (GRA)

N82-12173# Dayton Univ., Ohio.
ADVANCED COMBUSTION/PLUME DIAGNOSTICS Final Report, 1 Oct. 1978 - 30 Sep. 1980
Jay D. Eversole Jul. 1981 47 p refs
(Contract F04611-77-C-0042; AF Proj. 2308; AF Proj. 9993)
(AD-A105115; UDR-TR-81-01; AFRPL-TR-81-09) Avail: NTIS HC A03/MF A01 CSCL 21/2

The procedures and some results of an experimental program to record and analyze the thermal radiation from particles suspended in a gaseous flow (two-phase flow) are presented in this report. Carbon particles were added to a nitrogen gas stream at 800-900 K flowing at approximately 50 m/s. Thermal radiation from these particles was observed and recorded using a scanning monochromator for the wavelength range of 1.0 to 5.5 micrometers. These spectra were corrected for instrument response and are compared to theoretical calculations which predict the infrared emission from small particles. Since these predictive calculations depend on the particle size parameter, different techniques were used to obtain the average particle size in the two-phase flow. Author (GRA)

N82-12174# Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry.
ELECTRONIC EXCITATION IN MOLECULAR COLLISIONS: STRUCTURAL, DYNAMIC AND KINETIC CONSIDERATIONS Annual Summary Report, Sep. 1980 - Aug. 1981
R. D. Levine Aug. 1981 12 p refs
(Grant N00014-78-G-0036)
(AD-A105054) Avail: NTIS HC A02/MF A01 CSCL 07/4

The factors governing chemical reactivity with special reference to the role of electronic energy in promoting the reaction and to the production of electronically excited species are examined. The problem is studied both in general terms (i.e., the development of the required theoretical framework) and in application to specific systems. Author (GRA)

N82-12175# Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF COMBUSTION OF A COMPOSITE PLATE M.S. Thesis
Robert Emmett Luby, Jr. Jun. 1981 77 p refs
(AD-A104852) Avail: NTIS HC A05/MF A01 CSCL 21/2

The combustion of a porous graphite fiber plate is analyzed. A transient one-dimensional, mathematical model is utilized to conduct numerous computer tests. The model simulates the thermal response of a porous graphite fiber plate and it is based on appropriate energy equations. Two of the energy equations

are based on energy balances conducted on both the porous structure and on the air within the graphite fibers. The third energy equation is based on a mass balance performed on a differential volume of porous medium. A test plan is formulated and computer test runs are conducted to investigate the effects of plate thickness, filament diameter, permeability, porosity and exterior wind velocity on the thermal response of the porous graphite fiber structure. The test results are analyzed and conclusions are presented. Author (GRA)

N82-12176# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

ACETYLENE TERMINATED PHENYLENE THERMOSET SYSTEMS Final Report, Jan. - Oct. 1979

G. A. Loughran, B. A. Reinhardt, E. J. Soloski, and F. E. Arnold Jun. 1981 30 p

(AF Proj. 2419)

(AD-A105394; AFWAL-TR-81-4006) Avail: NTIS HC A03/MF A01 CSCL 07/3

A series of acetylene terminated phenylene (trademark) thermoset systems have been synthesized and their thermal and thermal mechanical properties correlated with molecular structure. The synthesis provided the materials as a mixture of monomer and oligomer. The monomer was separated from the oligomer by means of column chromatography. Their glass transition temperature before and after thermal cure were determined using DSC plus thermomechanical analyses (TMA). The thermal and thermooxidative properties of the materials were evaluated with cured monomers by thermogravimetric analysis and isothermal aging in air, at 600 F. Author (GRA)

N82-12177# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.

CARS SPECTROSCOPY OF GUN PROPELLANT FLAMES

L. E. Harris and M. E. McIlwain Sep. 1981 34 p refs

(AD-A105224; ARLCD-TR-81007) Avail: NTIS HC A03/MF A01 CSCL 14/2

Temperature measurements were made in a slightly fuel rich, premixed, propane/air reference flame and nitrate ester propellant flames burning in air at atmospheric pressure using Coherent Anti-Stokes Raman Scattering (CARS). Both single and multiple-pulse CARS nitrogen spectra in the reference flame agreed with model spectra and the derived temperature agreed with sodium line reversal values. Single pulse CARS nitrogen spectra obtained in the propellant flames were analyzed to give temperatures consistent with the values calculated using the NASA-Lewis thermochemical calculation. Comparison of a 0.1-second separated sequence of single pulse CARS spectra indicated turbulent air mixing in these propellant flames. The results demonstrated that temporal and spatially resolved temperature measurements could be determined in transient, turbulent flames. Author (GRA)

N82-12178# Atlantic Research Corp., Alexandria, Va. Combustion and Physical Science Dept.

CHEMISTRY OF COMBUSTION OF FUEL-WATER MIXTURES Final Technical Report, 1 Jun. 1980 - 31 May 1981

Edward G. Skolnik, Edward T. McHale, and Harley L. Heaton Sep. 1981 51 p refs

(Contract N00014-80-C-0534)

(AD-A105401) Avail: NTIS HC A04/MF A01 CSCL 21/2

The continuation of an experimental flame study concerning the nonphysical processes that lead to soot suppression when water is added to fuel, begun in a previous program is reported. The study included a mapping of temperature, chemical species and soot profiles of laminar diffusion flames with and without water added. Fuels studied included ethylene and a benzene/hydrogen mixture. Flames with nonreactive gases added (argon, nitrogen), were also studied for comparison purposes. The study concludes that the reduction of soot by water in an ethylene diffusion flame can be completely explained by thermal effects. The results are not as definitive for benzene. The addition of water causes a greater reduction in soot than does a thermally equivalent addition of argon, but no noticeable differences in chemical species profiles are observed. There is evidence, however, that water addition causes an increase in concentration of an oxygen-containing tarry substance present in the flame prior to soot formation. During the course of the study it was also possible to estimate both soot particle diameters (1-2 x .000001 cm at the beginning of the oxidation zone) and an activation energy for soot oxidation by the OH radical (7-8 kcal/mole). In addition, it was possible to confirm the presence of and quantify the oxygen concentration in the center of diffusion flames, first reported under the previous program. Author (GRA)

N82-12179# Pennsylvania State Univ., University Park. Dept. of Chemistry.

THE IMAGE POTENTIAL AND ION TRAJECTORIES IN SIMS

R. A. Gibbs, S. P. Holland, K. E. Foley, B. J. Garrison, and N. Winograd Sep. 1981 20 p refs Submitted for publication

(Contract N00014-80-C-0491; NR Proj. 051-744)

(AD-A105377) Avail: NTIS HC A02/MF A01 CSCL 07/4

The angle and energy distributions Ni+ ions ejected from ion bombarded Ni(001)c(2/2)-CO are shown to be in excellent agreement with classical trajectory calculations for Ni atoms if the calculations are corrected for the presence of an image force. Two important consequences of this observation are that the ionization probability, R+, is nearly isotropic and that it is only weakly dependent on particle velocity. These constraints impose severe restrictions on proposed ionization theories. Author (GRA)

N82-12180# Massachusetts Univ., Amherst. Astronomy Research Facility.

INFRARED EMISSION SPECTROSCOPY OF LOW PRESSURE GASEOUS DISCHARGES Final Report, 1 Oct. 1975 - 30 Sep. 1980

Hajime Sakai Hanscom AFB, Mass. AFGL Mar. 1981 51 p refs

(Contract F19628-76-C-0087; AF Proj. 2310)

(AD-A104123; UMASS-ARF-80-312; AFGL-TR-80-0355) Avail: NTIS HC A04/MF A01 CSCL 04/1

Our study conducted on the infrared emission of atmospheric atoms and molecules is summarized. In addition, the nitrogen emission study which was conducted in the final phase of the contract is reported. The singlet transition w 1 delta sub u minus a 1 pi sub g, which was partially observed by McFarlane, was fully observed and its band constants were determined. The only vibrational transition detected for the triplet transition W 3 delta sub u minus B 3 pi sub g was the (2-0) band. We failed to detect other members which belong to the same transition. Author (GRA)

N82-12181# California Univ., Livermore. Lawrence Livermore Lab.

BEHAVIOR OF ALKALI METAL-ACID PHOSPHATES DURING ELEVATED TEMPERATURE WATER ELECTROLYSIS

Margaret Steinbugler 19 Aug. 1981 14 p refs

(Contract W-7405-eng-48)

(DE82-000243; UCID-19192) Avail: NTIS HC A02/MF A01

Use of molten salts containing water as electrolytes for the high temperature (approx. 300 to 4000 C) electrolysis of water is explored as part of a research program on Thermochemical Cycles for the Production of Hydrogen. The purpose of this study is to determine the behavior of the phosphate-based electrolytes KH5 (PO4)2, LiH5 (PO4)2, and NaH5 (PO4)2, during electrolysis. The behavior of these molten salts was observed while measuring the cell potential as a function of time at constant current densities up to 1 A/cm(2) using platinum electrodes. Our experiments demonstrated several important characteristics of the electrolytes. Perhaps the most obvious characteristics is the tendency to dehydrate in an open container. This loss of water increases the potential for any given current and temperature for each electrolyte. This dehydration effect was most pronounced in the sodium- and lithium-based electrolytes, with the potassium-based electrolytes showing a relatively slow dehydration rate. DOE

N82-12182# Georgetown Univ., Washington, D.C.

INDUSTRIAL APPLICATION OF FLUIDIZED-BED COMBUSTION Quarterly Technical Progress Report, Jan. - Mar 1981

1981 123 p

(Contract DE-AC21-76ET-10381)

(DE81-030272; DOE/ET-10381/197) Avail: NTIS

HC A06/MF A01

An atmospheric fluidized bed boiler using high sulfur coal functioning as a source of steam was constructed and is operated as a demonstration plant. Operations since start up are summarized. Boiler thermal efficiency is low. Factors affecting efficiency are discussed. S.L.

N82-12183# Argonne National Lab., Ill.

SIMPLE CODE FOR CHEMICAL EQUILIBRIUM AND THERMODYNAMIC PROPERTIES FOR USE WITH GPSAP

Howard K. Geyer Jul. 1981 28 p refs

(Contract W-31-109-eng-38)

(ANL/MHD-81-11) Avail: NTIS HC A03/MF A01

A simple code for chemical equilibrium and thermodynamic properties calculations is described. The code, designed to enhance the General Purpose Systems Analysis Preprocessor (GPSAP) system code for performing system studies where many different gas streams may occur, is based on the law of mass action and conservation of element mass. Fifteen gas species are considered, with the equations representing chemical equilibrium, solved by a Broyden update technique. DOE

N82-12184# Colorado Univ., Boulder. Joint Inst. for Astrophysics.

STUDIES OF FREE RADICALS BY ULT..AVIOLET EXCIMER LASER PHOTOLYSIS Progress Report, 1 Apr. 1981 - 1 Oct. 1981

Stephen R. Leone 1981 29 p refs

(Contract DE-AS02-79ER-10396)

(DE82-000688; DOE/ER-10396/1) Avail: NTIS HC A03/MF A01

The reactions, energy transfer, and dynamics of free radicals produced by ultraviolet laser photolysis are investigated. Free radical chain reactions are analyzed by fully time-resolved techniques involving infrared emission spectroscopy. The low resolution infrared spectrum of the CH3(mu2) cut-of-plane bending vibrational progression is measured. Complex chain reaction chemistry is studied via the laser initiated chain reaction technique to provide a general analysis of the method to obtain rate constants and to probe the time evolution of energy disposal and product formation. Methods to probe very slow chain reactions and to measure absolute rate constants for methyl radical reactions are developed. DOE

N82-12185# General Atomic Co., San Diego, Calif.

FINES RECYCLE MODELING FOR AN ATMOSPHERIC FLUIDIZED-BED COAL COMBUSTOR Final Report

W. L. Brimhall, D. E. Fields, and W. S. Rickman Aug. 1981 66 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 1179-6)

(DE81-904223; EPRI-CS-2010) Avail: NTIS HC A04/MF A01

A fine carbon combustion model was modified to predict combustion efficiencies as a function of several process variables in the Babcock and Wilcox (B and W) 6 ft by 6 ft atmospheric fluidized bed coal combustor. The coal fines combustion kinetics were determined using the model and fines recycle test data from the combustor. The overall combustion efficiency was determined as a function of fines recycle rate, supercricial gas velocity, bed depth, freeboard length, and fines reentry temperature. The results of the model indicate that a fines recycle rate of approximately 2.5 times the coal feed rate is required to achieve a 99% combustion efficiency in the combustor using the current operating parameters. DOE

N82-12186# General Electric Co., St. Petersburg, Fla. Gas Turbine Div.

FUNDAMENTAL COMBUSTION STUDIES OF BURNING OIL-SPRAY FLAMES Final Report

Aug. 1981 102 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 1187-3)

(DE81-904248; EPRI-AP-1978) Avail: NTIS HC A06/MF A01

Burning processes in oil-spray flames are presented. Technical data for the design of low-NOx combustors for gas turbines are provided. Three studies are detailed: a bench-scale flame study, a full-size gas turbine combustor operated at atmospheric pressure, and measurements on full-size test-stand combustors operated at higher pressures. A laser velocimeter used to measure hot gas velocities is described, and the initiation of a combustion model study is reviewed. DOE

N82-12187# Energy and Environmental Research Corp., Santa Ana, Calif.

ASSESSMENT OF PULVERIZED-COAL-FIRED COMBUSTOR PERFORMANCE Quarterly Progress Report, 1 Apr. - 30 Jun. 1981

W. Richter, W. Clark, and R. Payne Jul. 1981 28 p refs

(Contract DE-AC22-80PC-30297)

(DE81-030860; DOE/PC-30297/T4; QPR-3) Avail: NTIS HC A03/MF A01

This program is concerned with the provision of a technology base to expedite the conversion of industrial processes from oil and gas to coal and other pulverized fuels. It addresses primarily the impact of fuel type on the thermal performance of a combustor. The program incorporates two experimental tasks and is constructed around an analytical task (Task 1) which will identify and upgrade a family of computer programs required to undertake thermal performance analysis studies. These anaytical tools will thus be used to predict the effects of parameters such as fuel type and furnace variables on combustor performance, and to identify those properties which have a major impact on thermal performance. The second task uses a combustion reactor to screen the key variable identified in Task I and to provide data on the properties of coal particulate matter which affect heat transfer performance. Verification of the engineering analytical approach will be provided by measurements made in a pilot-scale furnace in the third task. Progress is reported. DOE

N82-12188# Colorado State Univ., Fort Collins.

PALLADIUM-CATALYZED COUPLING REACTIONS: MECHANISM OF REDUCTIVE ELIMINATION Progress Report, 1 Oct. 1980 - 30 Jun. 1981

J. K. Stille Jun. 1981 28 p refs

(Contract DE-AS02-78ER-04903)

(DE81-030169; DOE/ER-04903/3) Avail: NTIS HC A03/MF A01

The mechanisms of the reductive elimination of alkyl partners from palladium, particularly under reaction conditions characteristic of the palladium-catalyzed coupling of organic halides and organometals, can take place either from Pd(II) or Pd(IV). The coupling of alkyl groups from a dialkylpalladium(II) complex requires that the organic partners be to one another. The reaction is a first-order intramolecular process that sometimes requires prior dissociation of a ligand, leading to a Y-or T-shaped intermediate. Coupling also can take place by the prior oxidative addition of organchalide to the dialkylpalladium(II) complex to yield a palladium(IV) species from which reductive elimination takes place rapidly. The reductive elimination step takes place with retention of geometry at an sp(2) carbon, and retention of configuration at an sp(3) carbon. Which catalytic reversible cycle, Pd(0) (FEMALE) Pd(II) or Pd(II) (FEMALE) Pd(IV) operates depends on the organic groups, the ligands and the reaction solvant.DOE

N82-12189# California Inst. of Tech., Pasadena. Dept. of Chemistry.

APPLICATION OF ION CYCLOTRON RESONANCE SPECTROSCOPY, PHOTOIONIZATION MASS SPECTROMETRY AND PHOTOELECTRON SPECTROSCOPY TO STUDY THE PROPERTIES AND REACTIONS OF IONS IN GASES Final Technical Report, 1 Apr. 1977 - 31 Mar. 1978

Jesse L. Beauchamp 9 Sep. 1981 24 p refs

(Contracts DE-AI03-76ER-72008; EY-76-S-03-0767)

(DE81-030296; CALT-767P8-8) Avail: NTIS HC A02/MF A01

Ion cyclotron resonance spectroscopy was used to study the acid-base properties of molecules, photoelectron spectra of free radicals, multiphoton dissociation of molecules with low-power continuous-wave infrared laser radiation, gas-phase organometallic chemistry, and radiative association reactions. A summary of the research is given with no data. A bibliography of 156 research publications is included. DOE

N82-12190# Oak Ridge National Lab., Tenn.

FUNDAMENTAL STUDIES IN CONTINUOUS ANNULAR

CHROMATOGRAPHY

R. J. Torres, C. S. Chang, and H. A. Epstein Sep. 1981 96 p refs Prepared in cooperation with MIT, Oak Ridge, Tenn.
(Contract W-7405-eng-26)
(DE82-000519; ORNL/MIT-329) Avail: NTIS HC A05/MF A01

The effects on separation performance of bed-rotation rate, bed loading, and feed concentrations are investigated using a pressurized continuous chromatograph. Ion-exchange chromatography was used to separate [Ni(NH3) 6-x(H2O)x] (2+), [Co(NH3)4CO3] (+), and [Co(NH3)5CO3] (+) with 1.6 M (NH4)2CO3 of pH 9.0 as eluant. The experimental results are compared with predictions of plate theory and with a theoretical multicomponent chromatography model. Experimentally observed band positions are accurately predicted in the low feed concentration region. The experimentally determined bandwidths, however, are underestimated. A correction to the experimantal bandwidths is necessary to account for the discrete nature of the sampling. DOE

N82-12191# Texas Southern Univ., Houston. Dept. of Chemistry.

SOLVENT EXTRACTION STUDIES USING HIGH-MOLECULAR-WEIGHT AMINES

C. McDonald 25 Aug. 1981 4 p refs
(Contract DE-AS05-76ER-04535)
(DE81-030061; DOE/ER-04535/8) Avail: NTIS HC A02/MF A01

This research project is concerned with systematically investigating high-molecular-weight amines and high-molecular-weight quaternary ammonium salts to ascertain the feasibility of their utilization for the extraction of group II B transition metal ions from aqueous solution. Methods which have promise of being scaled up for utilization by industries for the economical removal of toxic metal such as mercury, cadmium and nickel from their effluent waste water are being investigated. During this contract period, the following two research projects were completed: solvent extraction of mercury using alamine 304; and ion flotation of nickel using ethylhexadecyldimethylammonium bromide. DOE

N82-12192# Ames Lab., Iowa.

INDUCTIVELY COUPLED PLASMA AS AN ION SOURCE FOR THE DETERMINATION OF TRACE ELEMENTS IN SOLUTIONS BY MASS SPECTROMETRY Ph.D. Thesis

Robert Samuel Houk 1980 131 p refs
(Contract W-7405-eng-82)
(DE81-030744; IS-T-898) Avail: NTIS HC A07/MF A01

Aerosols of trace elements in solution are injected into an inductively coupled argon plasma to generate a relatively high number density of positive ions derived from the trace elements. A small fraction of these ions is extracted through a pinhole sampling orifice into a differentially pumped vacuum system housing an ion lens and quadrupole mass spectrometer. The positive ion mass spectrum obtained during nebulization of the solvent (1% HNO3 in H2O) consist essentially of ArH(+), Ar(+), H3O(+), H2O(+), NO(+), O2(+), HO(+), Ar2(+), Ar2H(+), and Ar(+)2. There are few potential interferences from solvent or argon ions above 42 u. The mass spectra of the trace elements studied consists almost entirely of singly charged monatomic (M(+)) or oxide (MO(+)) ions. The various isotopes of those elements studied are detected in the correct relative isotopic abundances. Several trace elements are readily detected in a mass spectrometer scanning mode at 0.05 SIGMA g/mL. Analytical calibration curves obtained in a single ion mode are linear over nearly four orders of magnitude with detection limits of 0.001 to 0.01 SIGMA g/mL for those elements studied. Rapid sample throughput, direct introduction of solutions, and the capability of direct isotopic determination of trace elements are among the features of this analytical approach. DOE

N82-12193# Purdue Univ., Lafayette, Ind.

SYNCHRONOUS FLUORESCENCE/MATRIX ISOLATION METHOD FOR TRACE ORGANIC ANALYSIS Progress Report, Jul. 1980 - Jul. 1981

Harry L. Pardue 1981 5 p
(Contract DE-AC02-79EV-10240)
(DE81-030958; DOE/EV-10240/T1) Avail: NTIS HC A02/MF A01

The principal components of the system are a high intensity Xenon arc lamp for excitation, two flat field f/4 spectrographs (J-4 Model UFS-2000) for dispersion of excitation and emission spectra, fused silica cuvette, an image dissector camera system (EMR Photoelectric 658A) for detection of emission intensity, a custom designed and constructed computer interface for scan control and data acquisition, and PDP-8 computer with assorted peripherals. Preliminary data indicate a range of at least 400 nm can be resolved to about 1 -nm for both excitation and emission spectra. Computer interface and software are designed to permit any one of three modes of operation: (1) the diagonal scans required to generate synchronous fluorescence spectra directly; (2) random access to any set of excitation/emission coordinates; and (3) total scans of any selected area (up to 100%) of the complete set of excitation/emission coordinates. The complete system became operational in late 1980. Data for anthracene are presented to illustrate system response. DOE

N82-12194# Wisconsin Univ., Madison. Dept. of Mechanical Engineering.

COAL COMBUSTION IN HIGH CONVECTIVE FLOWS Progress Report, 1 Mar. - 31 Aug. 1981

Kenneth W. Ragland 8 Sep. 1981 6 p
(Contract DE-FG22-80PC-30213)
(DE81-030391; DOE/PC-30213/T1) Avail: NTIS HC A02/MF A01

Fundamental data on ignition delay, volatile burn time, volatile reactivity, char burn time, char reactivity, aerodynamic drag, particle surface temperature, and internal porosity of burning coal particle are being obtained as a function of coal type, particle size, gas temperature, gas velocity and oxygen concentration. Simulation of conditions inside a furnace has been achieved in two test rigs which have been constructed. In the first rig single coal particle 3 to 12 mm diameter are suspended on a 0.02 mm diameter stainless steel wire which extends from an electronic balance into a 5 mm diameter tube containing flowing electrically heated gas. This setup extends the traditional thermogravimetric analysis to flowing systems. In the second rig coal particles are levitated freely in a 50 mm diameter diverging insulated quartz nozzle. To data 16 fixed particle test runs have been made-7 with a Kentucky bituminous coal, 3 with a Montana sub-bituminous and 6 with a Texas lignite. Gas temperture ranged from 760 to 11400K, flow rates 2 to 11 scfm, gas-particle velocities from 1.8 to 10.4 m/s, and Reynolds numbers from 100 to 1150. DOE

N82-12195# Physical Sciences, Inc., Woburn, Mass.

EFFECTS OF PREIGNITION ON PULVERIZED COAL COMBUSTION Quarterly Report, 1 Apr. - 30 Jun. 1981

Girard A. Simons and G. Kothandaraman Sep. 1981 66 p refs
(Contract DE-AC22-80PC-30293)
(DE81-030170; DOE/PC-30293/3; QR-3) Avail: NTIS HC A04/MF A01

A continous branching description of the pore tree has been developed. The pores branch in a continuous downsizing manner. The theory predicts that the total surface area of each tree may be several orders of magnitude greater than the surface area of the tree trunk. The total volume of the pore tree may be one order of magnitude greater than that of the trunk and the total height of the tree may be as much as 30 times the trunk diameter. All expressions for the size and shape of the pore tree reduce to that describing a single isolated pore in the limit that the trunk radius approaches the minimum pore radius. While the above description of the pore tree is consistent with the actual structure of a common shade tree, the features of the pore tree may best be verified through its transport properties. Char oxidation is shown to be sensitive to the structure of the pore tree. The continuous branching model developed herein accurately reproduces the kinetic and diffusion solutions which were utilized in developing the transport model. The validation of the transport model in describing char oxidation indirectly verifies the continuous branching description of the pore tree. DOE

N82-12196# Cornell Univ., Ithaca, N. Y.

PYROLYSIS OF COAL-DRIVED FUELS USING THE LASER-

POWERED HOMOGENEOUS PYROLYSIS TECHNIQUE Technical Progress Report, 5 Aug. 1980 - 31 Jul. 1981
P. C. T. deBoer 31 Jul. 1981 19 p refs
(Contract DE-FG22-80PC-30217)
(DE82-000251; DOE/PC-30217/T2) Avail: NTIS HC A02/MF A01

The progress made can be divided into two areas: theoretical work leading to an accurate computation of the temperature and velocity fields in the sample cell; and experimental work studying various chemical reactions involving hydrocarbons. The laser-powered homogeneous pyrolysis (LPHP) technique was applied to the unimolecular decomposition of 1,4-cyclohexandiene to benzene and hydrogen and of 1-chloropropane (n-propylchloride) to propene and hydrogen chloride as well as to the isomerization of cis-2-butene to trans-2-butent. These reactions proceed in different temperature ranges, with reaction rates that are well known. The temperature range covered is 575 to 8500K. The objective of this investigation was to establish proper operation of the LHLP technique over the temperature range of interest for the pyrolysis of coal-derived hydrocarbons. A set of equations was derived describing the motion of the strongly heated gas in the sample cell. The equations take account of the variations of viscosity and thermal conductivity with temperature, as well as of the dependence of the radiation absorption coefficient on temperature and density. DOE

N82-12197# Pittsburg and Midway Coal Mining Co., Englewood, Colo.
SOLVENT-REFINED COAL (SRC) PROCESS Final Report
Aug. 1981 87 p refs
(Contract DE-AC05-76ET-10104)
(DE81-031937; DOE/ET-10104/12) Avail: NTIS HC A05/MF A01

In late 1979 the Pittsburgh and Midway Coal Mining Co., recommended to the Department of Energy that certain areas of the SRC Pilot Plant should be modified to represent the SRC-II Demonstration Plant design. The proposed modifications were for design confirmation; start-up, transient and other operational guidance studies; and training of operator and professional personnel. The pilot plant facilities proposed for modification were: Coal Slurry Mixing - Area 01; Dissolver Effluent Cooling and Separation - Area 02; and Vacuum Flash/Residue Pump Testing - Area 04. A summary justification assessment for the modifications is included. A preliminary engineering study by Badger Energy, Inc. was completed in late 1980. A proposed to begin detailed engineering had been submitted to DOE for approval when all work was discontinued at the direction of the DOE in April 1981. DOE

N82-12198# Montana State Univ., Missoula.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Mar. - May 1981
Lloyd Berg and F. P. McCandless Jul. 1981 50 p
(Contracts EX-76-C-01-2034; DE-AC22-76ET-10495)
(DE81-030485; DOE/ET-10495/T2; FE-2034-23) Avail: NTIS HC A03/MF A01

Two runs of more than 100 hours of catalyst life were completed using SRC-I and SRC-II as the feeds. One run had catalyst regeneration every three hours, the other every eight hours. The catalyst, 4% CoO, 8% MoO3, 1% NiO and 8% WO3 on NALCO-78-6008C alumina base, reduced the nitrogen content to less than 0.3% showed no signs of deterioration in activity. Regeneration after the three or eight hour periods was by burnoff with oxygen in nitrogen followed by re-sulfiding with H2S in hydrogen. The liquid yield from SRC was 90% of which 30% was 50 to 2040C boiling range gasoline. It appears that a viable process to convert SRC into a feedstock acceptable to a petroleum refinery was discovered. A study of the effect of carbon laydown on pore volume and subsequent deactivation of the catalyst was carried out in a pressurized batch reactor. Little reduction in pore volume was noted. Three commerical catalysts, Harshaw HT400, NALCO MO477 and NALCO MN502, were evaluated with SRC-II. DOE

N82-12199# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
OXYDESULFURIZATION OF COAL BY ACIDIC IRON SULFATE SOLUTIONS M.S. Thesis
David A. Mixon and Theodore Vermeulen Aug. 1981 161 p refs
(Contract W-7405-eng-48)
(DE82-000464; LBL-9963-Rev) Avail: NTIS HC A08/MF A01

To facilitate by-product recovery and eliminate elemental sulfur formation in coal oxydesulfuirization, high-sulfur bituminous coal has been treated with aqueous ferric sulfate/sulfuric acid and oxygen at 100 to 1500C. The rate of pyrite oxidation increases with oxygen partial pressure, temperature, and fitness of grinding. This reaction rate is relatively insensitive to sulfuric acid and ferric sulfate concentrations, so that pyrite removal may be satisfactorily performed in solutions containing 25% H2SO4 and 12% Fe2(SO4)3 (weight percentages relative to total H2O plus HsSO4); preliminary data suggest that such a leaching solution is only mildly corrosive to T316 stainless steel, at 1500C or below, in the presence of oxygen. To provide an accurate assessment of coal oxydesulfurization stoichiometry, and analytical technique based on uv spectrophotometry has been developed for the determination of elemental sulfur in coal. Prepared coal samples are extracted for 24 hours with cyclohexane. Other exploratory oxydesulfurization runs have shown that vanadium oxides are not effective catalysts at 1000C, with oxygen. DOE

N82-12200# Utah Univ., Salt Lake City. College of Mines and Mineral Industries.
INVESTIGATION OF FACTORS AFFECTING THE IN-SITU COMBUSTION RETORTING OF OIL SHALE Final Report
H. Y. Sohn, C. H. Pitt, and A. G. Oblad 29 May 1981 166 p refs
(Contracts DE-AS03-78ET-13095; ET-77-S-03-1760; EF-77-S-04-3909)
(DE82-000482; DOE/ET-13095/T1) Avail: NTIS HC A08/MF A01

Subprocess taking place during an in situ combustion retorting of oil shale were investigated. Some of these subprocesses also occur in a surface retorting process. The specific topics of this research program include: (1) experimental determination of the intrinsic kinetics of kerogen decomposition producing oil; (2) mathematical formulation of the retorting of a oil shale block in the presence of heat transfer effects; (3) experimental determination of the intrinsic kinetics of oil shale char oxidation; (4) mathematical modeling of the oxidation of oil shale char in a spent shale block in the presence of heat and mass transfer effects; (5) determination of ignition delay and energy requirements for the ignition of an oil shale bed; (6) determination of thermal expansion of oil shale; and (7) determination of heat capacities of oil shale and the heat of decomposition of kerogen. The results of the investigation of these topics are presented. Some of the results have been published in journals which are readily available. In such a case only a brief summary of the results are presented. DOE

N82-12201# Brookhaven National Lab., Upton, N. Y.
DEHYDROGENATION/HYDROGENATION REACTIONS IN HYDROAROMATIC SYSTEMS
T. Gangwer 1981 6 p refs Presented at the Intern. Conf. on Coal Sci., Dusseldorf, West Germany, 7 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE81-027667; BNL-29825; CONF-810914-3) Avail: NTIS HC A02/MF A01

The basic chemistry of donor solvent dehydrogenation/hydrogenation process is an important component of liquefaction. Kinetic and mechanistic work on the hydroaromatic donors: tetralin (T), 1,2-dihydronapthalene (DN) and 9,10-dihydroanthracene (DA) is yielding insight into this chemistry. The chemical reactions are found to be heterogeneously controlled. The composition of product mixtures are sensitive to the initial density of the hydroaromatic reactant. As reactant density increases, the tetralin product mix changes. Reaction mechanisms are proposed which describe the observed processes in terms of reversible heterogeneous site reactions. A general reaction mechanism was developed which describes the observed reactant/product sequences. Conclusions are as follows: reactions of hydroaromatic systems can be modeled using the proposed heterogeneous reaction mechanism; dihydro-reactants can react along more than one pathway; and the extent of reaction is a

function of the hydrogen content of the heterogeneous surface. DOE

N82-12202# Brookhaven National Lab., Upton, N. Y.
ELECTROCATALYSIS AT OXIDE-COVERED METAL ELECTRODES
S. Gottesfeld (Tel-Aviv Univ.), J. Rishpon (Tel-Aviv Univ.), and S. Srinivasan 1981 18 p refs Presented at the Sym. on Electrocatalysis, Minneapolis, 10-15 May 1981
(Contract DE-AC02-76CH-00016)
(DE81-027650; BNL-29821; CONF-8105105-1) Avail: NTIS HC A02/MF A01

Thick oxide layers grown electrochemically on Rh, Ir, Ru and their alloys exhibit electrocatalytic properties associated with an internal redox process. For simple faradiac processes at the Rh/Rh oxide electrode it is shown that the rates of charge transfer and transport depend critically on the interaction between the redox couples in solution and in the oxide at the oxide electrolyte interface. The phenomenon of anodic activation found for the o.e.r. at Ru and Ru alloys is shown to be associated with film growth (monitored optically) and with the enhancement of the internal redox activity in the oxide. DOE

N82-12203# Technische Hochschule, Aachen (West Germany). Inst. fuer Verfahrenstechnik.
REMOVAL OF NITRATES FROM GROUND WATERS BY REVERSE OSMOSIS Final Report
Robert Rautenbach and Karl-Heinz Henne Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-155; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

A concept for hybrid ground water processing is presented, which makes it possible to economically reduce the content of nitrates to the allowable limit (50 ppm) while simultaneously reducing the total salt content, and to harmlessly dispose of the concentrated brine. A pilot plant (18 cum/hr drinking water) as well as a large capacity plant (360 cum/hr) were layed out and the total expected drinking water cost was calculated. After detailed engineering studies of the parameters, it was concluded that: (1) reverse osmosis (RO) is the most economical process for removing nitrates from ground water; yields of up to 91.5 % are possible; (2) agricultural utilization of the RO brine is not possible; and (3) considering operational and economical aspects, the modified process of multistage evaporation by expansion with a liquid circulating heat carrier is best compared with a multi-effect falling-film-evaporator seeding process, when directly evaporating the RO brine. However, this two stage hybrid process with an additional drinking water cost of 1.40 DM/cum is too costly. A more economical alternative for the discharge of the RO brine is a process consisting of; softening, electrodialysis and evaporation. Author (ESA)

N82-12204# Starck (Hermann C.) Berlin, Goslar (West Germany). Werk Goslar.
DEVELOPMENT OF A PROCESS FOR RECOVERY OF VALUABLE COMPONENTS FROM COMPLEX HYDRODESULFURIZATION CATALYSTS ESPECIALLY TUNGSTEN, MOLYBDENUM, VANADIUM, NICKEL AND COBALT Final Report
Bruno Krismer, Hans-Georg Nadler, and Hartmut Pungs Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 20 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-186; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4,20

For the nonpolluting recovery of the valuable components W, Mo, Co, Ni and V from complex hydrodesulfurization catalyst residues, an economical process was developed in which the valuable elements are reduced out by carbothermal reactions in the electric arc furnace as a first process step. The metal obtained is ground, roasted, and the oxides are dissolved in a combined acid-base dissolving process. The valuable elements are separated by liquid-liquid extraction steps which make it possible to isolate the valuable materials in the desired grade of chemical purity. Author (ESA)

N82-12205# Ruhrchemie A.G., Oberhausen (West Germany). Abt. Umweltschutz.
THERMAL PROCESSING OF USED CATALYSTS Final Report
Dieter Ernst and Sebastien Speth Bonn Bundesministerium fuer Forschung Technologie Dec. 1980 24 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-189; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,05

A preliminary treatment of the used catalysts following fluidized bed thermal processing is presented. It is possible to obtain a starting material free from organic impurities, which is suited to the usual recovery of the valuable components of the catalysts. In the course of the operation optimization, it was possible to successfully complete the feeding of the fluidized bed reactor with used catalysts from widely varying sources. The waste gas purification and fine dust separation comply with emission regulations. The unit is to be regarded as a demonstration plant, especially if waste heat utilization can be integrated to improve economic performance. Author (ESA)

N82-12206# Brown, Boveri und Cie, A.G., Heidelberg (West Germany). Central Research Lab.
MEASUREMENT PROCEDURE TO DETERMINE ORGANIC COMPOUNDS IN WATER (COMBUSTION METHOD) Final Report
Rainer Berthold, Gerold Gamer, Rudolf Krapf, Rainer Strietzel, and Karl Reiss Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-014; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,70

A procedure and an apparatus for measuring the content of organic compounds in water and providing a measured value correlating to the chemical oxygen demand are described. They provide cheap and reliable waste water analysis. The signal can be understood as a displacement of the equilibrium of the thermal dissociation of water (vapor) under the influence of organic (reducing) compounds. Contrary to the conventional technique, the procedure works without dosing of oxygen or carrier gas and continuously gives a measurement signal. It is therefore possible to realize on this basis an uncomplicated process measuring device, providing reproducible results. Author (ESA)

N82-12115*# State Univ. of New York at Stony Brook.
COMBUSTION EXPERIMENTS IN SPACE
A. L. Berlad *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 36-42
(For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 21B

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-12207 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE INFLUENCE OF DEFORMATION MODE DURING COLD FORMING ON THE POST-FORMED FLOW AND FRACTURE BEHAVIOR OF LOW CARBON AND HIGH STRENGTH LOW ALLOY STEEL SHEETS Ph.D. Thesis
Philippe Lucien Pascal Charpentier 1981 412 p
Avail: Univ. Microfilms Order No. 8114626

The influence of mode and amount of deformation during sheet formins on post formed flow and fracture behavior is studied in two hot rolled vanadium nitrogen high strength low alloy steels (an 80 ksi yield strength ferrite pearlite steel, and a dual phase steel) and in a hot rolled aluminum killed low carbon steel. Five modes of prior deformation are investigated: inplane

balanced biaxial stretching, plane strain deformation (cold rolling), uniaxial tension, cup drawing, and inplane compression, a laboratory forming technique developed to produce a drawing type deformation essentially free from strain gradients. The post formed yield strength was approximately given by the isotropic effective stress effective strain relationship after balanced biaxial stretching and cold rolling. However, after the three other deformation modes this result only applies in the direction of the positive (tensile) surface strain. Dissert. Abstr.

N82-12208 Iowa State Univ. of Science and Technology, Ames.
THERMOTRANSPORT OF HYDROGEN AND DEUTERIUM IN VANADIUM, NIOBIUM AND TANTALUM ALLOYS Ph.D. Thesis
Mark Francis Smith 1981 75 p
Avail: Univ. Microfilms Order No. 8122504

A mass spectrometric technique was used to simulataneously measure heats of transport for hydrogen and deuterium in single specimens of pure vanadium, niobium and tantalum, in vanadium alloyed with either niobium, titanium or chromium; and in niobium tantalum alloys. This technique greatly increased the precision with which isotope effects in the heat of transport could be measured. The predominant effect of alloying was to dramatically increase thermotransport, however, thermotransport decreased as niobium was added to tantalum. The heat of transport did not vary greater at low concentrations of the substitutional element. Heats of transport for hydrogen in pure vanadium, niobium and tantalum are 1.4, 11.9 and 28.5 kJ/mol, respectively and corresponding values for deuterium are 4.8, 18.0 and 34.8 kJ/mol. Dissert. Abstr.

N82-12209 California Univ., Los Angeles.
ACOUSTIC EMISSION OF PLASTIC FLOW IN METALS AND ALLOYS Ph.D. Thesis
Shuh-Yueh Simon Hsu 1981 231 p
Avail: Univ. Microfilms Order No. 8120973

A theoretical model of continuous acoustic emission (AE) originating from dislocation motion correlates the AE output voltages with dynamic dislocation behavior, including the unpinning, the operation of sources, the motion of mobile dislocations under the influence of internal stress and phonon drag, and the deceleration of mobile dislocations at obstacles. The strain, temperature and heat treatment dependencies of AE during tensile deformation are discussed for: high purity aluminum and copper; commercial 99.6% purity nickel; austenitic 304L and 316 stainless; and the solid solution alloys Cu-10Ni, Cu-30Ni; Cu-10Zn, Cu-15Zn, Cu-30Zn, Cu-40Zn, Ni-22Fe, and Cu-7.5Al. Dissert. Abstr.

N82-12210 Rensselaer Polytechnic Inst., Troy, N. Y.
STRUCTURE: PROPERTY RELATIONSHIPS IN GOLD BASED SLIDING ELECTRICAL CONTACT MATERIALS Ph.D. Thesis
Jaydev D. Desai 1981 309 p
Avail: Univ. Microfilms Order No. 8121142

Directionally solidified and chill cast two phase Au-Co and Au-Si alloys with a hard and insoluble second phase, and rapidly quenched (splat cooled) Au-Si alloys with simple phase amorphous and/or crystalline microstructures were examined from the standpoint of electrical resistivity, electrical noise, and wear resistance. The splat cooled alloys with their single phase amorphous and/or crystalline microstructures exhibited the highest wear resistance (as compared to the two phase Au-Si alloys with similar hardness), due to none or only a few crack nucleation sites, which is consistent with the delamination of wear. No discernable difference was found in the electrical noise performance of the DS eutectic Au-Co alloys as a function of the growth rate, which may be due to their similarity in electrical resistivities. The Au-Si alloy exhibited higher electrical noise than the Au-Co alloy in presence of isopropyl alcohol. Dissert. Abstr.

N82-12211 Johns Hopkins Univ., Baltimore, Md.
EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF HIGH POWER ULTRASOUND ON METALS Ph.D. Thesis
Richard Blase Mignogna 1981 127 p
Avail: Univ. Microfilms Order No. 8120040

The three most prevalent mechanisms proposed to account for the observed softening effects are simple superposition of the dynamic high power ultrasonic stress on the quasistatic stress, heating of the specimen caused by the applied waves with dislocations in localized regions of the test specimen. A decrease in the Young's modulus of the material during insonation is also suggested. A multiparameter experimental system was developed which permits simultaneous measurement of sufficient quantities to test all of the proposed mechanisms causing the softening effect. The results indicate that a combination of superposition of the dynamic stress on the quasistatic stress and interaction of the high power ultrasonic waves with dislocation is responsible for the softening. Dissert. Abstr.

N82-12212 Vanderbilt Univ., Nashville, Tenn.
INVESTIGATION OF THE ELECTROCHEMICAL BEHAVIOR OF ION-IMPLANTED Ti-Pt ALLOYS Ph.D. Thesis
Neil Garnett Thompson 1981 166 p
Avail: Univ. Microfilms Order No. 8120220

The corrosion behavior of Ti-Pt alloys were examined. Near-surface alloys of approximately 100 nm in depth were produced by the acceleration and penetration of the Pt ions into a Ti substrate. The near-surface alloys have a gaussian Pt concentration distribution. A combination of electrochemical examination and Rutherford backscattering analysis provided a means of quantitatively determining parameters which characterize the mechanisms involved in the dissolution of Ti-Pt alloys. The corrosion behavior of Ti-Pt alloys were examined in hydrogen saturated 1NH2SO4 at 30 C. High purity, cold fabricated Ti was employed for this study. The pure Ti samples were thoroughly examined electrochemically prior to implantation. Both, open-circuit potential and potentiostatic polarization measurements were used to characterize the implanted samples. Rutherford backscattering analysis (a non-destructive, quantitative determination of the Pt concentration depth distribution) was performed prior to, and at the completion of electrochemical examination. Dissert. Abstr.

N82-12213 Pennsylvania State Univ., University Park.
FRACTURE OF MAGNESIUM ALUMINATE SPINEL Ph.D. Thesis
Ronald Leroy Stewart 1981 158 p
Avail: Univ. Microfilms Order No. 8120467

The fracture toughness or K sub ic of magnesium aluminate spinel was measured as a function of orientation for single crystals, and for different grain sizes and stoichiometry (Al2O3 rich) for polycrystalline material. Measurements were made in air as a function of temperature to 1500 C. The single crystals of MgAl2O4 were measured in three different orientations having fracture planes of h/111/, and /110/. The /100/ orientation was also examined, at elevated temperatures, as a function of stressing rate. Hot-pressed stoichiometric polycrystalline MgAl2O4 was measured as a function of grain size over the range of 5 to 38 microns. Hot-pressed aluminia-rich super saturated spinel solid solutions were measured as a function of stoichiometry at the composition ratios of 1MgO:1.25Al2O3, 1MgO:1.50Al2O3, 1MgO:1.75Al2O3, 1MgO:2.00Al2O3, and 1MgO:2.50Al2O3, each at a grain size of approximately 35 microns. Dissert. Abstr.

N82-12214 Pennsylvania State Univ., University Park.
A PHENOMENOLOGICAL THEORY FOR PREDICTING THE TEMPERATURE DEPENDENCE OF ELASTIC COMPLIANCE IN SIMPLE PROPER FERROELECTRIC TUNGSTENBRONZES Ph.D. Thesis
Thomas Richard Shrout 1981 171 p
Avail: Univ. Microfilms Order No. 8120465

The Landau-Ginsburgh-Devonshire phenomenological theory for simple proper ferroelectrics was extended to include all elastoelectric coupling terms up to sixth order. For the tetragonal ferroelectric bronze Sr(0.61)Ba(0.39)Nb2O6 direct measurements by induced piezoelectric resonance in the paraelectric phase clearly showed a coupling between the stiffened elastic compliances on induced electric polarization in a manner consistent with that predicted from the sixth order electrostriction. The sixth order electrostriction (phi) constants were used to predict the elastic behavior in the spontaneously polarized ferroelectric phase region. The observed behavior of the phi constants was consistent with other higher order constants being only weakly temperature dependent and thus likely also compositionally independent. The phenomenological method does permit the correlation of low

temperature data in the ferroelectric phase with a limited family of temperature independent higher order constants of the simpler paraelectric symmetry and with accumulating experience. Dissert. Abstr.

N82-12215 Rensselaer Polytechnic Inst., Troy, N. Y.
GRAVITATIONAL INFLUENCE ON BINARY ALLOY MELT EQUILIBRIA AND EUTECTIC SOLIDIFICATION Ph.D. Thesis
Robert Stanley Sokolowski 1981 174 p
Avail: Univ. Microfilms Order No. 8121164

A high-temperature ultracentrifuge was developed from the concept of a compact, low cost, air-turbine. The equation governing sedimentation equilibrium in homogeneous liquid binary alloys is derived in differential form by defining a gravochemical potential, which includes inertial terms in addition to the usual chemical potential. The resulting first order non-liner ordinary differential equation is solved and the results are presented graphically. Microstructures of Pb-Sn and Bi-Sn eutectic alloys are presented as experimental evidence supporting the numerical results and refuting conflicting data found in the literature on clustering liquid alloys. These results are discussed with regard to the nucleation behavior of alloys and solidification fluid dynamics. A series of eutectic alloys, mainly Pb-Sn and Bi-Sn were solidified under centrifuged fields. The unique behavior of alloy solidification at high levels of acceleration is revealed by numerous microstructural data which are discussed and interpreted. Dissert. Abstr.

N82-12216*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROGRESS IN PROTECTIVE COATINGS FOR AIRCRAFT GAS TURBINES: A REVIEW OF NASA SPONSORED RESEARCH
John P. Merutka 1981 29 p refs Presented at the 5th Ann. Conf. on Composite and Adv. Mater., Merritt Island, Fla., 19-22 Jan. 1981; sponsored by the Am. Ceramic Soc., Inc.
(NASA-TM-82740; E-711) Avail: NTIS HC A03/MF A01 CSCL 11F

Problems associated with protective coatings for advanced aircraft gas turbines are reviewed. Metallic coatings for preventing titanium fires in compressors are identified. Coatings for turbine section are also considered. Ductile aluminide coatings for protecting internal turbine-blade cooling passage surface are also identified. Composite modified external overlay MCrAlY coatings deposited by low-pressure plasma spraying are found to be better in surface protection capability than vapor deposited MCrAlY coatings. Thermal barrier coating (TBC), studies are presented. The design of a turbine airfoil is integrated with a TBC, and computer-aided manufacturing technology is applied. S.L.

N82-12217# Materials Research Labs., Ascot Vale (Australia).
LIQUIDUS TEMPERATURES OF COMMERCIAL ESR SLAGS
Richard C. Andrew and George M. Weston May 1981 21 p refs
(AD-A105268; MRL-R-813) Avail: NTIS HC A02/MF A01 CSCL 11/6

Melting point data for a number of slag systems of particular interest in the electroslag refining of steel have been determined under laboratory conditions. In several instances, the melting point temperatures determined differed considerably from those quoted commercially. Such discrepancies were attributed to the presence of impurities in the raw feed materials, causing their composition to differ considerably from nominal. Author (GRA)

N82-12218# Materials Research Labs., Ascot Vale (Australia).
SURVEY OF NICKEL-ALUMINIUM-BRONZE CASTING ALLOYS ON MARINE APPLICATIONS
G. M. Weston Apr. 1981 38 p refs
(AD-A105263; MRL-R-807) Avail: NTIS HC A03/MF A01 CSCL 11/6

The structure and corrosion performance of nickel-aluminium bronze (NAB)--covered by naval specification DGS-8520 and DGS-348--have been investigated. No evidence was found to suggest that there would be any significant difference in corrosion performance between alloys meeting the two specifications. Early corrosion problems associated with the weld repair areas of castings have been overcome largely by using improved foundry and welding techniques followed by a heat-treatment procedure. Both crevice and pit corrosion still occur in operating systems. However, recent reports indicate that with improved NAB foundry practice this is less widespread, with penetration often being confined to the surface grains. Author (GRA)

N82-12219# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.
A FUNDAMENTAL STUDY OF FATIGUE IN POWDER METALLURGY ALUMINUM ALLOYS Final Technical Report, Mar. 1977 - Feb. 1981
A. Lawley and M. J. Koczak Aug. 1981 93 p refs
(Grant AF-AFOSR-3247-77; AF Proj. 2306)
(AD-A105080; AFOSR-81-0692TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

Processing-microstructure-fatigue relationships have been examined in high-strength powder metallurgy aluminum alloys (Al-Cu, Mg, Zn, Co) in air and salt fog. Three phases were included: (i) The combined effects of cobalt level and processing mode on fatigue life and resistance to crack propagation; (ii) The role of plane-strain forging on fatigue life and crack propagation response; (iii) The combined effects of cobalt level and processing mode on strain-controlled low-cycle fatigue. While the interplay between processing history, alloy composition and orientation is complex, a basic understanding of the role of microstructure on the crack initiation and propagation stages of fatigue has been obtained. Direct comparisons of the corresponding fatigue response of counterpart ingot metallurgy alloys were included. In general, the P/M processed material exhibits superior resistance to fatigue crack initiation compared to the I/M form. However the relative crack growth rates in the P/M and to the I/M form. However the relative crack growth rates in the P/M and I/M materials depend on orientation and the level of delta K. Author (GRA)

N82-12220# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
COMMENTS ON THE HYDROGEN SOLUBILITY DATA FOR LIQUID LEAD, LITHIUM AND LITHIUM-LEAD ALLOYS AND REVIEW OF A TRITIUM-SOLUBILITY MODEL FOR LITHIUM-LEAD ALLOYS
E. M. Larsen, M. S. Ortman, and K. E. Plute May 1981 17 p refs
(Contract DE-AS02-78ET-52048)
(DE81-030828; DOE/ET-52048/18; UWFDM-415) Avail: NTIS HC A02/MF A01

The projected use of lithium-lead alloys as the tritium breeding blanket and heat transfer agent in fusion reactors requires data on the solubility of hydrogen isotopes in the alloys at the temperatures of interest. In the absence of available experimental data in the desired temperature range, estimates were made on the hydrogen isotope solubility in the lithium-lead alloys. In NUMAK, solubility estimates were based on activity studies of lithium in lithium-lead while in WITAMIR the solubility was extrapolated from deuterium measurements in the alloy at higher temperatures. Existing data are summarized and methods of estimating the tritium solubility in the desired temperature range are reviewed. DOE

N82-12221# Ames Lab., Iowa.
MECHANICAL PROPERTIES AND HYDROGEN EMBRITTLEMENT OF SCANDIUM M.S. Thesis
Michael Paul Zalesky Feb. 1981 95 p refs
(Contract W-7405-eng-82)
(DE81-030745; IS-T-918) Avail: NTIS HC A05/MF A01

The strength and ductility of polycrystalline scandium were studied as a function of hydrogen concentration and test temperature. The effects of hydrogen on the mechanical behavior of scandium are dicussed in terms of current embrittlement concepts for hydride forming metals. Hydrogen concentrations ranging from 0.20 to 20.83 atomic percent and temperatures from 78 to 473 K were employed. Scanning electron microscopy fractographs illustrate the modes of tensile failure. DOE

N82-12222# Bendix Corp., Kansas City, Mo.
MECHANICAL PROPERTIES OF TITANIUM CASTINGS
M. G. Ulitchny Sep. 1981 13 p ref
(Contract DE-AC04-76DP-00613)

(DE81-030693; BDX-613-2680) Avail: NTIS HC A02/MF A01

Cast and hot isostatically pressed Ti-6Al-4V and Ti-6Al-6V-2Sn alloys were tested for mechanical properties. Specimens from these alloys were tested in as received, mill annealed, and solution treated and aged conditions. Results show that tensile strength at least equal to the quaranteed minimum for wrought titanium can be developed using solution treat and age heat treatments. The fracture toughness associated with this strength level is adequate, but tensile ductility is usually less than the desired 10 percent level. Development of modified heat treatments would likely lead to increase in ductility and would extend the uses of titanium alloy castings. DOE

N82-12223# Rockwell International Corp., Golden, Colo. Energy Systems Group.

SILVER FILMS FOR SOLID STATE BONDING

E. R. Naimon, R. G. Kurtz, D. Vigil, L. Williams, and G. A. Riordan, ed. 13 Aug. 1981 13 p refs

(Contract DE-AC04-76DP-03533)

(DE82-000414; RFP-3125; DOE/TIC-4500-Rev-69) Avail: NTIS HC A02/MF A01

Silver films deposited from a hot hollow cathode source continue to be instrumental in promoting high-strength solid state bonds at Rocky Flats. Such phenomena as effects of surface condition prior to coating, effects of varying times between coating and bonding, and effects of film thickness on bond strength are discussed. DOE

N82-12224# Joint Research Centre of the European Communities, Ispra (Italy). Engineering Div.

THERMAL DESORPTION SPECTRA, EQUILIBRIUM DESORPTION RATES AND EQUILIBRIUM SURFACE COVERAGES OF MECHANICALLY POLISHED AND OF SAND AND BEAD BLASTED INCONEL 600 SURFACES

J. Camposilvan and F. Reiter 1980 44 p refs Submitted for publication

(EUR-7114-EN) Avail: NTIS HC A03/MF A01

Equilibrium surface coverage and equilibrium outgassing rate of materials facing the plasma in fusion technology are studied. Inconel 600 surfaces were examined in the temperature range from 20 to 550C. The first sample was mechanically polished and had a total hemispherical emissivity at low temperatures Epsilon = 0.146 and a surface roughness CLA1 = 0.08 microns while the second sample was sand and bead blasted with Epsilon = 0.382 and CLA2 = 1.2 microns. Author (ESA)

N82-12225# Riso National Lab., Roskilde (Denmark). Metallurgy Dept.

FATIGUE PHENOMENA IN COPPER

Kurt Viggo Rasmussen Sep. 1980 81 p refs In DANISH; ENGLISH summary

(Riso-M2241; ISBN-87-550-0703-1; ISSN-0418-6435) Avail: NTIS HC A05/MF A01

The relevant literature on low amplitude fatigue in single crystals and polycrystals is briefly reviewed. Results of experiments are shown. Single crystals and polycrystals of pure copper were fatigued in tension-compression at constant low amplitudes of plastic strain and low cycling frequencies at room temperature in air. Surface patterns of persistent edge dislocations were quantitatively examined by optical microscopy. Bulk dislocation microstructures were examined by transmission electron microscopy. The microstructure and mechanical behavior observed for the single crystals are in close quantitative agreement with comparable existing fatigue data. The cyclic stress-strain diagram of the polycrystals shows a plateau in a linear plot. The area fraction of edge dislocations on the polycrystals increases roughly linearly with the plastic strain amplitude. The dislocation microstructure in bulk grains consist of regular wall structures embedded in a matrix of less regular structures. Author (ESA)

N82-12226# Technical Research Centre of Finland, Espoo. Metallilab.

SUBSTITUTING COPPER ALLOY TUBES IN OLD SEA WATER CONDENSERS

Pertti Auerkari 1981 34 p refs In FINNISH; ENGLISH summary

(VTT-87; ISBN-951-38-1211-1; ISSN-0355-6395) Avail: NTIS HC A03/MF A01

The use of chromium alloyed copper nickels (CACN), titanium, and stainless steels to replace copper alloys in sea water condensers is discussed. The corrosion resistance of titanium tubes is good at normal temperatures, but because of vibration problems, they are suitable only if the distance between the supporting plates can be reduced. When stainless steels are used the former support plate distance is normally sufficient. With both titanium and stainless steel retubing, care should be taken to achieve tight and leak free joints, good in service cleaning, and reliable corrosion protection of the end plates and other condenser parts that are in contact with the substituting tubes. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-12227 Rutgers - The State Univ., New Brunswick, N. J.

MICROSTRUCTURE FORMATION IN THE Au-SiO2 CERMET DURING ANNEALING Ph.D. Thesis

Joseph Thomas McGinn 1981 219 p

Avail: Univ. Microfilms Order No. 8122101

The microstructure of Au-SiO2 cermet films was characterized as a function of both annealing time and Au concentrtion. Results indicate that the cermet forms a two phase system with discrete prticles of Au surrounded by a SiO2 matrix. With annealing, the Au particles both decrease in number and increase in size. The growth mechanism is shown to be a complex combination of Ostwald ripening and particle coalescence. The microstructure of the individual Au particles exhibits a variety of well ordered boundary structures. These boundaries are shown to be separate twin related grains and to result from particle-particle coalescence and subsequent grain boundary migration. The simple boundary structures which are observed in these particles makes it possible to distinguish between 'growth accident' and 'pop-out' models of annealing twin formation. The theory of annealing twin formation is extended to account for the explicit nature of the twin boundaries observed. Dissert. Abstr.

N82-12228 Rensselaer Polytechnic Inst., Troy, N. Y.

MOLECULAR ORIENTATION IN POLYMERS: A STUDY OF HOT-DRAWN POLYMETHYLMETHACRYLATE Ph.D. Thesis

Jay Scott Rosenthal 1981 287 p refs

Avail: Univ. Microfilms Order No. 8121159

Using hot-drawn polymethylmethacrylate as the particular material for investigation, a number of different aspects of orientation were examined. The parameters employed to characterize orientation are investigated in order to resolve the present controversy regarding the characterization of orientation. Also the relationship between the draw process, the orientation state, and mechanical properties is explored. These investigations are related to a third aspect of the orientation process which is concerned with the rheology of the polymer. This involves the concepts of a spectrum of rheological events describing the process of deformation and orientation. The results reported for when the material is drawn at constant draw rate and cooled or drawn at constant draw rate, relaxed and then cooled agree quantitatively with the predictions of the draw model, thus confirming the concept of a disentanglement spectrum. Dissert. Abstr.

N82-12229 Rutgers - The State Univ., New Brunswick, N. J.

THE EFFECT OF PRESSURE ON THE PHYSICAL AND MECHANICAL PROPERTIES OF SOLITHANE 113 ELASTOMER Ph.D. Thesis

David Lee Questad 1981 158 p

Avail: Univ. Microfilms Order No. 8122116

Pressure-volume-temperature measurements of Solithane 13, a polyurethane elastomer, showed that the glass transition temperature increased linearly for pressures up to about 2.5kbar, and then nonlinearly with pressure up to more than 6kbar. The change in thermal expansivity decreased rapidly with pressure at low pressures. The specific volume in the glassy state was shown to depend on the glass formation pressure. Plotting the

dielectric data as an activation plot show that the activation energy at a certain frequency is independent of pressure. Ultrasonic longitudinal velocity measurements show a broad step decrease in the region of the attenuation maxima as the temperature was raised at each isobar. Stress strain measurements show that recovery of plastic strain is pressure dependent, and that the strain of fracture increases with increasing pressure.
Dissert. Abstr.

N82-12230* International Harvester Co., San Diego, Calif.
FORMULATION AND CHARACTERIZATION OF POLYIMIDE RESILIENT FOAMS OF VARIOUS DENSITIES FOR AIRCRAFT SEATING APPLICATIONS Final Report, 15 Feb. 1980 - 30 Sep. 1981
J. Gagliani, R. Lee, and U. A. K. Sorathia 30 Sep. 1981 151 p refs
(Contract NAS9-16009)
(NASA-CR-167421; CSR81-R-4834-20) Avail: NTIS HC A08/MF A01 CSCL 11G

Light weight, heat and fire resistant low smoke generating polyimide foams are developed for aircraft seating applications. The material is upgraded and classified into groups for fabrication of cushions possessing acceptable comfort properties. Refinement and selection of foaming processes using a variety of previously developd foaming techniques and definition of property relationships to arrive at the selection and classfication of polyimide foams into five groups in accordance with predetermined ILD values are emphasized. S.L.

N82-12231# Naval Research Lab., Washington, D. C.
APPLICATION OF HIGH PRESSURES TO CERAMICS Interim Report
R. W. Rice 13 Oct. 1981 14 p refs
(RR0220242)
(AD-A105249; NRL-4637) Avail: NTIS HC A02/MF A01 CSCL 11/2

The use of pressure, an important variable in the study and especially the processing of ceramics, is first briefly reviewed showing that most pressures used are well below the high pressure range. Three areas of high pressure studies of ceramics that can be important in understanding ceramic behavior and can also be useful in specialized ceramic processing are then briefly outlined: compaction of powder or porous bodies, phase conversion (often with consolidation), and plastic deformation. Formation and consolidation of diamond and cubic BN are only briefly noted since they are extensively addressed elsewhere. It is shown that powder outgassing can be an important problem for some of these processes. Particular attention is given to impact or shock treatment, especially compaction of powders, and to hot extrusion of ceramics, including conventional as well as hydrostatic extrusion. Next, possible future application of high pressure to processing of ceramics is addressed. Explosive compaction of ceramics, especially of certain tougher ceramic composites wherein a synergism may be effective is suggested. Then the past and potential application of high pressure in mechanically working and shaping ceramics is discussed, again in part focused on processing tougher ceramic composites.
Author (GRA)

N82-12232# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
ORIENTATION MEASUREMENTS FROM POLYMER SURFACES USING FOURIER TRANSFORM INFRARED PHOTOACOUSTIC SPECTROSCOPY
K. Krishnan, S. Hill, J. P. Hobbs, and C. S. P. Sung Sep. 1981 18 p refs
(Contract N00014-78-C-0676)
(AD-A105398; TR-4) Avail: NTIS HC A02/MF A01 CSCL 11/9

Fourier Transform IR Photoacoustic (FTIR-PAS) dichroism studies have been applied to determine molecular orientation from the surface of one-way drawn poly(ethylene terephthalate) film. When compared with ATR dichroic spectra obtained with a modified, rotatable sample holder on the same sample, PA spectra show saturation effects in strong absorption bands near 1730, 1250 and 1100/cm, probably due to the greater penetration depth in the PA technique. The dichroic ratios (k sub x/k sub y) on the plane of the sample film have been calculated from PA spectra, only on bands which do not show saturation and compared with the analogous ratios determined from ATR dichroic spectra. For three well-known parallel bands at 1335, 975 and 795/cm the dichroic ratio is greater than unity in both ATR and PAS, as expected from the drawing process. In general, somewhat lower dichroic ratios are observed by PA spectra than by ATR spectra with this sample. Possible reasons for this trend are discussed. This study demonstrates the potential of FTIR-PAS dichroism as a complementary technique to ATR dichroism, especially on samples with rough or brittle surfaces.
Author (GRA)

N82-12233# Ohio State Univ., Columbus. Dept. of Ceramic Engineering.
CERAMIC MICROSTRUCTURE DEVELOPMENT Progress Report, 1 Apr. - 15 Aug. 1980
Dennis W. Readey Oct. 1980 6 p
(Contract N00014-80-C-0523)
(AD-A105364) Avail: NTIS HC A02/MF A01 CSCL 11/2

Results from various investigations of ceramic microstructure development are outlined. Halilde oxidation, oxide precursor melt decomposition, Ostwald ripening in halide melts, aqueous precipitation, particle packing, and sintering and vapor transport are discussed. M.G.

N82-12234# Rockwell International Corp., Golden, Colo.
PAINT SELECTION FOR COATING RADIOACTIVE-WASTE DRUMS
J. L. Briggs 1 Jul. 1980 22 p refs Presented at ASTM Rockwell Intern. Corrosion Conf., Nashville, 23 Jun. 1981
(Contract DE-AC04-76DP-03533)
(DE81-026259; RFP-3119) Avail: NTIS HC A02/MF A01

White epoxy paint sample E is suitable for coating waste drums, but the additional pretreated costs of grit blasting prior to paint application precludes adoption of that paint system. The specified 10.0 mil coating thickness of that coating also incurs higher costs. The Vorac epoxy phenolic base paint (buff or yellow) is the only other paint that exhibits suitable corrosion and impact resistance required for coating the waste drums. In addition, that paint does not require a grit blasted substrate or other costly pretreatment prior to coating. DOE

N82-12646# Joint Publications Research Service, Arlington, Va.
GLASS-MAT-REINFORCED THERMOPLASTIC: STRONG, EASY TO WORK
Martin Welz, Erkhard Siler, and Hartmut Schriever *In its* W. Europe Rept.: Sci. and Technol., No. 72 (JPRS-78876) 1 Sep. 1981 p 1-14 Transl. into ENGLISH from Tech. Rundschau (Bern), 2 Jun. 1981 p 33 and 35 (For primary document see N82-12645 03-44)
Avail: NTIS HC A03/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-12235 Saint Louis Univ., Mo.
A NON-LINEAR MODEL FOR LOW VELOCITY UNDERWATER EXPLOSIONS Ph.D. Thesis
Mark Albert Dablain 1980 223 p
Avail: Univ. Microfilms Order No. 8120607

The theory and computed results of an explosion model based upon a perturbation technique are presented. The perturbation parameter was selected to be the ratio of the initial particle velocity to the liquid sound speed. The explosion model is studied in conjunction with the air-gun source of seismic marine exploration. The distinction between this model and past models is the preservation of wave propagation interior to the sphere. Although the effects of these interior waves seem to be negligible for explosion sources with high initial velocities, their interaction with the gas-liquid boundary seem to significantly affect the

expansion of bubbles from the low velocity air-gun source. The theory indicates that during bubble growth the bubble surface expands toward its equilibrium radius while oscillating about intermediate points during the whole course of its motion. Although direct and clear observational data seem to be lacking, the data which are available lend support to this idea.
Dissert. Abstr.

N82-12236 Dartmouth Coll., Hanover, N.H.
PARTIAL ACID HYDROLYSIS PRETREATMENT FOR ENZYMATIC HYDROLYSIS OF CELLULOSE: A PROCESS DEVELOPMENT STUDY OF ETHANOL PRODUCTION Ph.D. Thesis
Diane Ruth Knappert 1981 175 p
Avail: Univ. Microfilms Order No. 8121523

Cellulosic substrates (poplar, corn stover and bagasse) were pretreated in a continuous, plug flow reactor at conditions of 160-220 C, 0-1.5% acid, and retention times up to 13 seconds. The pretreated material was then hydrolyzed with Trichoderma reesei C30 cellulase, for 48 hours. Glucose concentrations were measured during the 48 hours of hydrolysis, and results are compared to those from controls, hydrolysis of untreated material. Results show a significant increase in glucose yields after pretreatment. For example, after pretreatment, glucose yields from hydrolysis of poplar as high as 75% are obtained, compared to 20% yields from hydrolysis of untreated poplar. Successful pretreatments are found to solubilize about 40% of the poplar hemicellulose. The cost of producing ethanol using a 10 MM gal/yr plant size are evaluated, and the process is scaled up to a 50 MM gal/yr plant. Dissert. Abstr.

N82-12237 Tufts Univ., Boston, Mass.
THE STABILIZATION OF COAL-OIL MIXTURES Ph.D. Thesis
Mary Adams Viola 1981 501 p
Avail: Univ. Microfilms Order No. 8121367

An understanding was developed of the stabilization by three methods: the addition of water; the addition of chemical additives; and the control of the particle size distribution (PSD) of the coal (so-called ultrafine COM). Aggregation of the coal particles was determined to control both the sedimentation and rheological properties of the COM. The degree of coal particle aggregation depends upon the nature and PSD of the coal powder, on the nature of the oil used, and the use of chemical additives, such as water and/or surfactants. Dissert. Abstr.

N82-12238 Houston Univ., Tex.
SOLID-SOLID REACTIONS IN COAL CONVERSION PROCESSES Ph.D. Thesis
Daniel Clark Baker 1981 198 p
Avail: Univ. Microfilms Order No. 8120902

The thermal stability of calcium sulfate and sulfated coal ashes was studied as well as the catalytic effect of metal carbonates on coal char gasfication. Five model reactions which could result in undesirable evolution of sulfur oxides are considered: decomposition of pure CaSO4 between 950 C - 1130 C; decomposition of CaSO4 in the presence of thin film melts of KCl and NaCl at 1020 C; reactions of CaSO4 with metal oxides in binary systems at 1020 C; reactions of CaSO4 with aluminosilicates in multicomponent systems at 1020 C; and decomposition of sulfated coal and lignite ashes at 820 C and 1020 C. Metal carbonates did not change the mechanism of char gasification when CO2 was the reactive gas. It was noted that reactions of the solid-solid complex with silicates and aluminosilicates in the ash of the char can result in loss of catalytic activity and poor catalyst recovery. Dissert. Abstr.

N82-12239 Engins Matra, Velizy (France).
EXPLOSION EXPERIMENTS USING CYLINDRICAL AND CONICAL CHARGES [EXPERIMENTATION D'EXPLOSION AU CEG GRAMAT SUR DES CHARGES CYLINDRIQUES ET CONIQUES]
P. Croizer 24 Jan. 1980 17 p In FRENCH
(N-40-1871-0) Avail: Issuing Activity

High speed photographs of explosions, taken to check the accuracy of a computer model (STRESS 2DL), are presented. Conical and cylindrical charges composed of 65% hexogen and 35% TNT were detonated in either steel or aluminium envelopes. Explosions were photographed at 960,000 frames/sec for the aluminium cylinder and cone, and 480,000 frames/sec for the steel cone. Agreement with model predictions is good.
Author (ESA)

N82-12240*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HYDRODESULFURIZATION OF CHLORINATED COAL Patent Application
John J. Kalvinskas (JPL, California Inst. of Technology, Pasadena) and Naresh K. Rohatgi, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 30 Oct. 1981 24 p
(Contract NAS7-100)
(NASA-Case-NPO-15304-1; US-Patent-Appl-SN-315587) Avail: NTIS HC A02/MF A01 CSCL 21D

A method of desulfurization is described in which high sulfur coals are desulfurized by low temperature chlorinolysis of coal in liquid media, preferably water, followed by hydrodesulfurization at a temperature above 500 C. The coals are desulfurized to an extent of up to 90% by weight and simultaneously dechlorinated to a chlorine content below 0.1% by weight. The product coals have lower volatile loss, lower oxygen and nitrogen content and higher fixed carbon than raw coals treated with hydrogen under the same conditions. Heating the chlorinated coal to a temperature above 500 C in inert gas such as nitrogen results in significantly less desulfurization. NASA

N82-12241*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SUPERCRITICAL MULTICOMPONENT SOLVENT COAL EXTRACTION Patent Application
William H. Corcoran, inventor (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 30 Oct. 1981 27 p
(Contract NAS7-100)
(NASA-Case-NPO-15767-1; US-Patent-Appl-SN-315584) Avail: NTIS HC A03/MF A01 CSCL 21D

The yield of organic extract from the supercritical extraction of coal with larger diameter organic solvents such as toluene is increased by use of a minor amount of from 0.1 to 10% by weight of a second solvent such as methanol having a molecular diameter significantly smaller than the average pore diameter of the coal. NASA

N82-12242# General Accounting Office, Washington, D. C.
STATUS OF THE GREAT PLAINS COAL GASIFICATION PLANT
16 Mar. 1981 30 p
(EMD-81-64) Avail: NTIS HC A03/MF A01

A coal gasification plant with a production capacity of 125 million cubic feet per day of high Btu gas, equivalent to about 22,000 barrels of oil per day, is proposed for Mercer County, N. Dak. This synthetic gas is a direct substitute for natural gas. The process employed to convert the coal to gas is the Lurgi pressurized, fixed bed gasification process with Lurgi methanation. S.L.

N82-12243# Drexel Univ., Philadelphia, Pa. Environmental Studies Inst.
MICROBIAL METHANE FERMENTATION KINETICS FOR TOXICANT EXPOSURE Final Report, Jul. 1979 - Aug. 1981
Gene F. Parkin, Walter M. Kocher, and Steven W. Miller 31 Aug. 1981 281 p refs
(Contract F49620-79-C-0190; AF Proj. 2312)
(AD-A104868; AFOSR-81-0680TR) Avail: NTIS HC A13/MF A01 CSCL 06/13

Methane fermentation of industrial wastes offers the dual potential of pollution abatement and energy conservation. This report presents results of experiments designed to investigate the effects of toxic substances on methane bacteria. Toxicants studied were calcium, cadmium, chromium, nickel, sulfide, chloroform, dichloroethylene, trichloroethylene, ethyl benzene, cationic surfactants, gasoline, jet fuel, and hydrazine. The effect of toxicant concentration, solids retention time, and temperature on methanogenic response, acclimation, and reversibility was studied. Experiments included slug and continuous addition of toxicants. GRA

N82-12244# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

COMBUSTION MECHANISMS OF SOLID PROPELLANTS Annual Technical Report, 1 Aug. 1979 - 31 Jul. 1980

E. W. Price, R. K. Sigman, and R. R. Panyam 27 Jul. 1981 39 p refs

(Contract N00014-79-C-0674)

(AD-A105163) Avail: NTIS HC A03/MF A01 CSCL 21/2

Investigation of mechanisms of combustion and combustion zone microstructure continued, using ammonium perchlorate-hydro-carbon binder sandwiches and the quench-burning method to obtain high resolution measurements. Binder-thickness deflagration limits were also determined, and work started on measurement of burning rate vs binder thickness. On the basis of results to date, a modified picture of the combustion zone is proposed that differs sharply from the classical model, particularly in those regions of the sandwich surface that are close enough to the AP-binder interface to correspond to processes in solid propellant combustion. Author (GRA)

N82-12245# State Univ. of New York Coll. at Fredonia. Dept. of Chemistry.

A SEARCH FOR NEW FUEL COMPONENTS IN EXPLOSIVE MIXTURES WITH AMMONIUM NITRATE Final Report, 1 May 1980 - 30 Apr. 1981

Maurice C. Neveu 30 Apr. 1981 25 p refs

(Grant AF-AFOSR-0134-80; AF Proj. 2303)

(AD-A104881; AFOSR-81-0697TR) Avail: NTIS HC A02/MF A01 CSCL 19/1

A series of about 80 dye samples was tested by differential scanning calorimetry (DSC) for eutectic formation with ammonium nitrate and release of energy. Thirteen of these showed these desired characteristics. These were in the class of oxazines and dioxazines with ionic groups; and of ionic and non-ionic aminoanthraquinones. A discussion is given about the possibility of the non-ionic aminoanthraquinones to form eutectic mixtures with ammonium nitrate. A synthesis of 2,2'4,4'6,6'-hexanitro-3,3'-biphenol was carried out and its thermal properties as well as those of its potassium and ammonium salts were determined by differential scanning calorimetry. The significance of the use of dyes as fuels in fuel/oxidizer explosive systems and of the Colour Index for the discovery of further intermolecularly reacting explosive systems is discussed. Author (GRA)

N82-12246# Maryland Univ., College Park. Computer Vision Lab.

HOW A DIGITAL COMPUTER CAN TELL THAT A STRAIGHT LINE IS STRAIGHT

Azriel Rosenfeld and Chul E. Kim Jul. 1981 21 p refs

(Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A105076; TR-1072; AFOSR-81-0658TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Recent results on digital straightness and convexity are reviewed, and it is shown that the criteria for a set of lattice points to be the digitization of a convex set, or for a digital arc to be the digitization of a straight line segment, depend critically on the definition of digitization that is used. Author (GRA)

N82-12247# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

PREFRACTURE BEHAVIOR OF SOLID PROPELLANTS Final Report, Sep. 1978 - Jul. 1980

C. C. Hsiao, S. S. Chern, and C. H. Cheng Edwards AFB, Calif. AFRPL Jul. 1981 72 p

(Contract F04611-78-C-0078; AF Proj. 2307)

(AD-A104746; AFRPL-TR-81-52) Avail: NTIS HC A04/MF A01 CSCL 21/9

A preliminary research in propellant prefracture behavior has been conducted. Both theoretical and experimental approaches have been carried out according to three phases of a program. Phase I was primarily concerned with the development of a mathematical model which would be applicable to a single prefracture configuration of solid propellant under stress. The occurrence of such a prefracture configuration in polymeric systems is usually termed a craze. Concurrently an experimental technique was to be developed for determining the displacement and stress fields in the vicinity of a craze. During this phase some specially prepared propellant polymers with and without ammonium perchlorate were tested. In Phase II extension to highly filled propellant polymer samples was to be added to the investigations. Phase III was to extend the studies to massive crazing and craze-crack transition and fracture propagation. This report covers the attempts made and work done in Phase I. Since the nature of this research is basic and complex, the efforts and developments are reported under separate headings as reflected in Section 2. GRA

N82-12248# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering.

DETERMINATION AND ANALYSIS OF JET AND MISSILE FUEL DEPOSITS Final Report

James L. Lauer 14 Aug. 1981 32 p

(Contract N00164-79-M-2522)

(AD-A105458; NWSC/CR-RDTR-151) Avail: NTIS HC A03/MF A01 CSCL 21/4

Jet fuel deposits, some of them supplied on their original support by Dr. Hazlett of the Naval Research Laboratory, were examined by attenuated total reflection spectroscopy and by infrared Fourier transform emission spectroscopy for the purpose of finding a procedure suitable for in situ analysis. The infrared radiation emitted by samples at 50-65 C was adequate for qualitative analysis, which can readily be made quantitative by further work. Definite sharp peaks corresponding to aromatic materials were found. Author (GRA)

N82-12249# Los Alamos Scientific Lab., N. Mex.

PREDICTION OF CRYSTAL DENSITIES OF ORGANIC EXPLOSIVES BY GROUP ADDITIVITY

James R. Stine Aug. 1981 28 p refs

(Contract W-7405-eng-36)

(DE81-032016; LA-8920) Avail: NTIS HC A03/MF A01

The molar volume of crystalline organic compound is assumed to be a linear combination of its constituent volumes. Compounds consisting only of the elements hydrogen, carbon, nitrogen, oxygen, and fluorine are considered. The constituent volumes are taken to be the volumes of atoms in particular bonding environments and are evaluated from a large set of crystallographic data. The predicted density has an expected error of about 3 percent. These results are applied to a large number of explosive compounds. DOE

N82-12250# Aerospace Corp., El Segundo, Calif. Mobile Systems Directorate.

PROJECT FOR RELIABILITY FLEET TESTING OF ALCOHOL/GASOLINE BLENDS Technical Progress Report

Jul. 1981 85 p refs

(DE82-000004; DOE/CS-50023/T15) Avail: NTIS HC A05/MF A01

Progress is reported in reaching the near-term goal of bringing the end-use technology for formulated alcohol/gasoline blends to the point of commercial technical readiness, in support of the Alcohol Fuels Program element of the DOE Alternative Fuels Utilization Program (AFUP). Activities considered include acquiring data for proof-of-concept through engineering tests in a small controlled fleet using various formulated blends of ethanol/gasoline and methanol/gasoline as well as for statistical proof-of-performance through large-scale reliability fleet tests using selected blends. Implementation of the 4-year plan is continuing in accordance with funding availability. DOE

N82-12251# United Technologies Corp., South Windsor, Conn. Power Systems Div.

EVALUATION OF SHALE OIL AS A UTILITY GAS-TURBINE FUEL Final Report

A. P. Grasso, R. A. Sederquist, F. G. Sykes, J. Frese, J. McVey, G. Lewis (Pratt and Whitney Aircraft, West Palm Beach, Florida), and J. Mathason (Pratt and Whitney Aircraft, West Palm Beach, Florida) Aug. 1981 139 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 1691-2)

(DE81-904234; EPRI-AP-1975) Avail: NTIS HC A07/MF A01

An FT4A-9 engine and a selected single-can combustor from an O engine were tested using No. 2 petroleum distillate fuel and hydrotreated Paraho shale oil residual, with and without water injection. The engine operated successfully with low smoke

when running on shale oil residual and No. 2 petroleum distillate fuel. The use of hot water injection was successfully demonstrated with reduced No/sub x/ emissions when operating on both fuels. Post-test engine inspection showed that all combustor components, including turbine inlet vanes, were in good condition. No/sub x/ emissions from single-can combustor testing with both fuels exceeding engine levels. Carbon monoxide and unburned hydrocarbons were slightly lower. DOE

N82-12252# Los Alamos Scientific Lab., N. Mex.
PROPAGATION OF A LIQUID-LIQUID EXPLOSION
Francis H. Harlow and Hans M. Ruppel Aug. 1981 13 p refs
(Contract W-7405-eng-36)
(DE81-030780; LA-8971-MS) Avail: NTIS HC A02/MF A01

Direct contact between two liquids, one cold and the other hot, may be both fluids results in rapid local boiling, which may initiate a propagating liquid-liquid explosion. A mechanism is discussed for the propagation that involves implosion of the film, rapid mixing of the fluids, heat exchange to warm the cold fluid above the temperature for spontaneous nucleation, and the explosion generation of vapor, which in turn continues to sustain the film implosion. Plausibility for the model is demonstrated by means of numerical studies by high speed computer. DOE

N82-12253# EMCON Associates, San Jose, Calif.
STATE OF THE ART OF METHANE GAS ENHANCEMENT IN LANDFILLS
Jun. 1981 70 p refs Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE82-000155; ANL/CNSV-23) Avail: NTIS HC A04/MF A01

Of great importance to the effective design and operation of landfill gas recovery systems are certain parameters that affect the lag time, yield, and rate of production of landfill-generated methane. These enhancement parameters include moisture content, pH buffering of the aqueous phase, nutrient addition, bacterial seeding, particle size, and density of refuse. Laboratory and field observations suggest that an increase in moisture content, coupled with buffering by a pH of 7 and the addition of nutrients and bacteria, will result in a shorter lag time while increasing both the yield and rate of methane generation. Work performed to date, however, does not enable quantifying functional relationships between the methanegenic process and its parameters. Such quantitative data are needed to predict overall process dynamics and optimize the design of any recovery system. DOE

N82-12254# Boeing Engineering and Construction, Seattle, Wash. Engineering and Construction Div.
FEASIBILITY AND ECONOMIC STUDY OF MEDIUM-Btu COAL GAS BLENDED WITH HIGH-Btu BY-PRODUCT GAS AS AN INDUSTRIAL ENERGY SOURCE AT BILLINGS, MONTANA Final Report
May 1981 297 p refs Prepared in cooperation with Northern Resources, Inc., Billings, Mont.
(Contract DE-FG01-79RA-20219)
(DE81-030622; DOE/FE-20219/2) Avail: NTIS HC A13/MF A01

The technical and economic feasibility of blending a medium Btu gas (MBG) produced from coal by the Winkler fluidized bed gasification process with excess refinery fuel gas to be used as an industrial fuel in Billings, Montana is assessed. The background of the project, the site selection process, the conceptual design of the process and supporting facilities, the retrofit requirements and other costs associated with burning the MBG, the environmental and permitting aspects of the project, the cost estimates and economic considerations, the contract provisions for MBG buy/sell agreements; the government's role in supporting the project, and the market potential for the project in Billings and similar projects in other markets are discussed. The project is technically feasible and economically viable today although parity with conventional fuels will not occur until 1985. DOE

N82-12255# Brookhaven National Lab., Upton, N. Y. Catalyst Group.
DEVELOPMENT OF CATALYTIC SYSTEMS FOR THE CONVERSION OF SYNGAS TO JET FUEL AND DIESEL FUEL AND HIGHER ALCOHOLS Annual Report
William A. Slegeir Oct. 1980 18 p
(Contract DE-AC02-76CH-00016)
(DE82-000067; BNL-51423) Avail: NTIS HC A02/MF A01

A highly active series of Fischer-Tropsch catalysts are developed on the basis of insights provided by the oxide theory. The method of catalyst formulation is unique in Fischer-Tropsch chemistry, yet is simple and reproducible. These catalysts are superior to ordinary catalysts for hydrocarbon synthesis with regard to rate, operating conditions, and, product selectivity and longevity. The products of these catalysts are ideally suited for use as diesel and jet fuels. Once formed, the catalysts display remarkable stability toward air. Oxide interactions, the role of promoters, and the synergistic behavior of bimetallic catalysts systems are studied. Bimetallic systems for hydrocarbon and alcohol synthesis are discussed. DOE

N82-12256# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ETHANOL PRODUCTION VIA FUNGAL DECOMPOSITION AND FERMENTATION OF BIOMASS, PHASE 2 Semiannual Progress Report, Oct. 1980 - Mar. 1981
Antonios A. Antonopoulos and Edward G. Wene Mar. 1981 21 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract W-31-109-eng-38)
(DE82-000104; ANL/EES-TM-148) Avail: NTIS HC A02/MF A01

Research efforts focused mainly on continuing the: (1) isolating, culturing, and maintaining of Fusarium strains for biochemical evaluation; (2) screening for potentially cellulolytic F. strains; (3) searching for lignolytic and hemicellulolytic F. strains; (4) screening for effective pentose- and hexose-fermenting F. strains; and (5) evaluating various methods and materials for the optimization of certain fermentation parameters. Approximately 200 additional Fusarium isolates were isolated and screened; all showed cellulolytic activity, with 50 showing increased activity. Several isolates that formed fusoid to spheroid spores and cells on Xylan media were observed to retain their morphology in cellulose suspensions. All tested isolates were found to ferment glucose to ethanol; some yielded amounts of ethanol approaching those produced by yeast. In screening more than 600 isolates for Xylose fermentation, 25 were identified as effective fermenters. Reutilization of inoculum during consecutive fermentations was employed to facilitate higher ethanol yields from Xylose. A few Fusarium isolates indicated relatively high ethanol tolerability. DOE

N82-12257# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ETHANOL PRODUCTION VIA FUNGAL DECOMPOSITION AND FERMENTATION OF BIOMASS Progress Report
Antonios A. Antonopoulos and Edward G. Wene Sep. 1980 25 p refs
(Contract W-31-109-eng-38)
(DE82-000103; ANL/EES-TM-147) Avail: NTIS HC A02/MF A01

Recorded evidence that Fusarium strains decompose cellulose, hemicelluloses, pectic substances, and lignin, and also ferment both pentoses and hexoses to ethanol promoted the following activities: (1) collecting and reviewing relevant bibliographic materials for a forthcoming publication; (2) isolating, culturing, and maintaining Fusarium, Trichoderma, and actinomycetous strains for biochemical screening and evaluation; (3) manipulating the genetic constitution of promising Fusarium strains to develop more effective strains for the decomposition and fermentation of biomass; (4) screening for potentially cellulclytic Fusarium and Trichoderma strains; (5) searching for lignolytic and hemicellulolytic Fusarium strains; and (6) screening for effective pentose- and hexose-fermenting Fusarium strains. More than 500 Fusarium strains and about 150 Trichoderma strains show cellulolytic activity. DOE

N82-12258# Sandia Labs., Albuquerque, N. Mex.
W76 ELASTOMERS/PROPELLANT COMPATIBILITY
J. I. Martinez and D. A. Bouchard Jun. 1981 25 p refs
(Contract DE-AC04-76DP-00789)
(DE81-031933; SAND-81-0240) Avail: NTIS HC A02/MF A01

The survivability of unsealed section materials in a C-4

propellant outgassing environment was addressed. The compatibility of various materials, including the elastomers in an exaggerated environment was created by using an unrealistically large ratio of propellant to materials. Although most materials fared reasonably well in the test, it became obvious that further investigation of the elastomeric seals was necessary. The behavior of the elastomeric seals was also examined in a more realistic environment. DOE

N82-12259# Pittsburg Energy Technology Center, Pa.
SYNTHESIS GAS CONVERSION TO LIQUID FUELS USING PROMOTED FUSED IRON CATALYSTS
Richard A. Diffenbach, Richard R. Schehl, and Daniel J. Fauth Sep. 1981 67 p refs
(DE81-030857; DOE/PETC/TR-81/3) Avail: NTIS HC A04/MF A01

More active and stable nitrided iron catalysts were prepared for the conversion of synthesis gas to a proudct with a high alcohol content that could be used directly as an automotive fuel or converted to a gasoline-like product over a shape selective zeolite in a dual reactor unit. The rational is given for the preparation of a molybdenum-promoted nitrided fused ion catalyst. Catalyst characterization yielded equivocal results as to whether a mixed Fe-Mo nitride was formed. Regardless of the nature of the Mo-containing species, these catalysts were significantly more active than unpromoted nitrided fused iron catalyst. Characterization of fused iron catalysts using thermogravimetric analysis indicated the rates of reduction, carburization, and nitriding were strongly dependent on reaction temperature and particle size as well as the nature of the promoter. X-ray diffraction measurements indicated the metal crystallite size of the reduced catalysts was strongly dependent on reduction temperature. DOE

N82-12260# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF HYDROCONVERSION OF BIOMASS TO SYNTHETIC FUELS Technical Progress Report, 1 Jan. - 31 Mar. 1981
Jul. 1981 56 p refs
(Contract DE-AC02-80CS-83004)
(DE81-030954; DOE/CS-83004/3) Avail: NTIS HC A04/MF A01

The physical and chemical characterization data for Douglas fir hog fuel, maple hardwood, and corn stover are presented for comparison. Fluidization parameters were obtained for mixtures of char and hollow alumina spheres (-25 + 60 mesh) as the inert bed material. The driving characteristics of maple hardwood were measured isothermally in the range of 2000 to 4000 F. Three distinct moisture content regions were observed with different characteristic drying behaviors. Size reduction characteristics show that the throughput rate for various product screen sizes is lower for the moist, as-received feed than for the dried feed material. The hydrodevolatilization data of maple hardwood from the rapid heat-up rate, free-fall apparatus were analyzed. Comparison of the steam-char gasification rates of coal, peat, and maple hardwood chars shows that the reactivity level expected of the biomass char is significantly higher than that of coal and peat. DOE

N82-12261# Department of Energy, Morgantown, W. Va.
FIXED-BED GASIFICATION
Jan. 1981 29 p refs
(DE82-000432; DOE/METC/SP-184) Avail: NTIS HC A03/MF A01

Since the completion of construction in 1967, the METC Gasifier Pilot Plant has produced data and demonstrated operation on all major ranks of US coals. In 1976, METC began an expansion program to include a novel gas-cleanup facility to evaluate the environmental problems associated with gasification plants and also to develop improved cleanup systems. The construction and checkout of this full-scale cleanup system was completed within the past year and the pilot-plant facility now has the capability of gasifying all US coals and producing a relatively tar, oil, particulate, and sulfur free fuel gas. The Department of Energy's (DOE) fixed-bed gasification evelopment program includes other facilities that provide DOE with a broad capability to address alternative and advanced gasification technologies. In addition to utilizing these facilities to evaluate and improve gasification/cleanup configurations, the pilot plants are also being used to support a number of related projects. DOE

N82-12262# Argonne National Lab., Ill.
DENSITY-MEASUREMENT STUDIES AT THE BI-GAS PILOT PLANT
S. H. Sheen and A. C. Raptis Sep. 1981 17 p refs
(Contract W-31-109-eng-38)
(DE82-000910; ANL/FE-81-57) Avail: NTIS HC A02/MF A01

An acoustic flow/no-flow monitor for the char return line of the BI-GAS pilot plant was developed. The indicator has operated successfully for the last three years. It was observed that the strength of the microphone signal is related to the amount of char in the line. In a recent experiment at BI-GAS this observation was further explored, and it was found that the signal is related to the char valve opening in the frequency range of 1 to 20 kHz. This is a clear indication that the flow/no-flow indicator can be upgraded to a density meter and consequently to a true mass flowmeter. This can be done by installing another flow/no-flow indicator upstream or downstream of the existing one and cross-correlating the two signals. DOE

N82-12263# Oak Ridge National Lab., Tenn.
SELECTIVE SEPARATION OF COAL FEEDSTOCKS FOR CONVERSION BY MAGNETIC SEPARATION TECHNIQUES
E. C. Hise and A. S. Holman 1981 8 p refs Presented at 91st Natl. Meeting of the Am. Inst. of Chem. Engr., Detroit 16 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028060; CONF-810814-6) Avail: NTIS HC A02/MF A01

The Open-Gradient Magnetic Separation (OGMS) technique can separate particles on the basis of small differences in magnetic susceptibility. The highly reactive coal macerals are diamagnetic while the minerals and less reactive macerals range from slightly diamagnetic to paramagnetic with the pyritic minerals exhibiting the greatest positive magnetic susceptibility. OGMS can spread a falling stream of fine coal into a spectrum permitting the physical separation of these several maceral and mineral groups. Several eastern bituminous coals were selectively separated into five to ten fractions. Petrographic examination of these separated fractions shows a concentration of the maceral and mineral groups in the appropriate fractions. It is proposed that the selective separation of the most reactive macerals, as well as of those minerals that exhibit a catalytic effect, can enhance the efficiency of coal conversion. DOE

N82-12264# California Univ., Livermore. Lawrence Livermore Lab.
DESIGNING PROCESS WELLS FOR AN UNDERGROUND COAL-GASIFICATION ENVIRONMENT
D. S. Thompson Jun. 1981 20 p refs Presented at 7th Underground Coal Conversion Symp., Fallen Leaf Lake, Calif., 8 Sep. 1981
(Contract W-7405-eng-48)
(DE81-028434; UCRL-85839; CONF-810923-7) Avail: NTIS HC A02/MF A01

The reasons why process well integrity is important are covered in a review and evaluation of significant data generated from various field tests, including identification of well failure mechanisms. A close relationship is observed between process well behavior and process performance. As a logical extension of this evaluaton, design and performance criteria for underground coal gasification (UCG) process wells are developed. Applications to the next generation of field tests are presented in the form of proposed design features for UCG process wells, features intended to prevent the failure modes that have occurred in past field experiments. DOE

N82-12265# Utah Univ., Salt Lake City. Dept. of Mining and Fuels Engineering.
CHARACTERIZATION OF WESTERN COALS AND COAL MACERALS BY SOLID STATE NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY Progress Report
Ronald J. Pugmire and David M. Grant 5 Aug. 1981 60 p refs

(Contract DE-FG22-80PC-30226)
(DE81-028928; DOE/PC-30226/T1) Avail: NTIS HC A04/MF A01

Progress in the establishment of a laboratory for petrographic analysis and maceral separation of bituminous coals is reported. Coals high in maceral concentration (i.e., vitrinite, bituminite, fusinite, or semi-fusinite) are selected for analysis using an NMR spectrometer. Laboratory techniques are described. S.L.

N82-12266# Chemische Werke, Huels (West Germany). Marketforschung.
ASSESSMENT OF POTENTIAL FUTURE MARKETS FOR THE PRODUCTION OF HYDROGEN FROM WATER Final Report
Helmut Kalenda and Gerhard Ruckelshauss Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 232 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-012; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 39,60

The market potential of hydrogen as a chemical raw material and a secondary energy carrier in the Federal Republic of Germany was assessed for various market sectors for the period from 1985 to 2025. The present status of research and technology is depicted. The hydrogen demand in the market sectors of chemistry, petroleum refining industry, steel production, energy, and transport are assessed. Hydrogen production costs for different actual and future technologies are asessed and compared with the production of competing energy carriers, including nuclear high temperature heat. The anticipated demand of hydrogen, broken down according to market sectors is given for the years 1985, 2005 and 2025, taking into account the development of the national and global energy demand. Eight technologies for the production of hydrogen and four technologies for the production of synthetic natural gas are compared, both technically and economically. Hydrogen from high temperature electrolysis of steam is expected to enter the market as a competitive energy carrier not before 2015 to 2025. Author (ESA)

N82-12267# Engins Matra, Velizy (France).
APPLICATION OF THE PISCES TWO DIMENSIONAL ELK PROGRAM TO EXPLOSION CALCULATIONS [APPLICATION DU PROGRAMME PISCES 2D ELK AUX CALCULS D'EXPLOSION]
M. L. Bourdin 4 Jun. 1981 121 p In FRENCH
(N-40-2815-0) Avail: NTIS HC A06/MF A01

Results for the explosion using a eulerian code, and for the steel using a lagrangean, are presented. Internal and kinetic energy in the steel and the explosion are given for both codes. Cone deformations calculated by Pisces and by Stress (2D)L are provided. Only a few minor modifications are required to perfect Pisces (2D)ELK. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-12268 Utah State Univ., Logan.
FINITE ELEMENT ANALYSIS OF SOIL-SHEET PILE INTERACTION Ph.D. Thesis
David William Nyby 1981 232 p
Avail: Univ. Microfilms Order No. 8120717

A finite element model which accurately and economically models soil-sheet pile structures was developed. The model was used to analyze cantilever and anchored sheet pile walls. The finite element model includes transition and interface elements. The transition element has the capability of conforming to the displaced shape of the sheet pile elements on one side (cubic element) and soil elements on the other sides (bilinear element). The interface element models the frictional resistance between the soil and the sheet pile. It behaves elastically below a threshold force level (Coulomb friction) and perfectly plastic above this value. The soil is modeled using nonlinear constitutive relations. These relations are used for both the transition elements and the bilinear elements. The economy of the finite element model was increased in two ways. Closed-form integration was used to reduce the computational effort and an equation solver was used which takes advantage of the banded, symmetric, and positive-definite characteristics of the global stiffness matrix. Dissert. Abstr.

N82-12269 Polytechnic Inst. of New York, Brooklyn.
AN IMPROVED MODEL FOR SOIL-STRUCTURE INTERACTION ANALYSIS Ph.D. Thesis
Abdul Quddus Mohammad 1981 170 p
Avail: Univ. Microfilms Order No. 8118889

A model for beams supported on a soil layer of finite thickness is developed by proposing that such foundations may be represented by vertical springs (with stiffness, k) connected by shear springs (representing shear properties of soil) defined by shear stiffness, k sub s. A method of solution based on the principle of minimum potential energy is proposed for such a model. Numerical examples for a wide range of foundation variables are worked out for displacement of the contact surface along the length of the beam as well as beyond the physical limits of the beam. The pressure distribution at the interface and the bending moment of the beam are also solved. Numerical results indicate that displacements, pressure distribution, and bending moment differ considerably as compared to Winkler solution. Dissert. Abstr.

N82-12270 Washington Univ., Seattle.
SOIL STABILIZATION BY CHEMICAL ADDITIVES Ph.D. Thesis
Fouad Muhammed Ghazali 1981 229 p
Avail: Univ. Microfilms Order No. 8121199

The effects of phosphoric acid and lime additives on the compaction characteristics, the cohesion value, and the angle of friction of soils containing various percentages of Kaolin clay were compared and the applicability of Sherif's procedure for determining the coefficient of lateral earth pressure at rest for chemically stabilized soils was investigated. Both additives were found to increase the cohesion and the angle of friction of compacted sandkaolin clay mixtures. Increments were greater in basic addition than in acidic addition. The increment in the cohesion value is dependent mostly on clay content, water content and dry density while the increment in the angle of friction is mostly dependent on clay content and water content, with the factors of the type and content of the chemical common to both increments. Compaction data indicate that maximum dry density, and optimum water content are dependent on clay content and chemical type and content. The expression proposed by Sherif was found to be applicable for chemically treated cohesive soils. Dissert. Abstr.

N82-12271 Iowa State Univ. of Science and Technology, Ames.
BEHAVIORAL PREDICTIONS OF COMPACTED EMBANKMENTS ON RIGID FOUNDATIONS Ph.D. Thesis
Darwin Eugene Fox 1981 231 p
Avail: Univ. Microfilms Order No. 8122513

Samples of excavated schists were taken during construction from railroad right-of-way of the nearly vertical multicolored beds used in embankments as high as 35 m. From one site, composite samples weighing 667 N each were taken of individual colored layers, red, yellow, white, and black, at a depth of 30 m. The red layer was also sampled at a depth of 8 m, and a representative mixed sample was taken from the adjacent fill area. At a second site, 50 km eastward, a grey-green micaceous schist, more highly metamorphosed, was at the 35 m depth. Samples were examined by X-ray diffraction and electron microscopy. Standard engineering tests placed all samples in the ASSHTO A-4 classification, close to the boundary of A-5, being nonplastic or with low plasticity indexes, and with liquid limits from 30 to 38. Based on results of an Iowa K-Test and a mathematical model, earth pressure and settlement predictions are made, and stability calculations along a cycloidal rupture surface are shown. Procedures are seen to be compatible with simplified hand calculationns or computerized finite element techniques, and produce realistic values. Dissert. Abstr.

N82-12272 Rensselaer Polytechnic Inst., Troy, N. Y.
STRAIN AND PORE PRESSURE BEHAVIOR OF FINE

GRAINED SOILS SUBJECTED TO CYCLIC SHEAR LOADING Ph.D. Thesis
Rune Dyvik 1981 360 p
Avail: Univ. Microfilms Order No. 8121143

The behavior of fine grained soils subjected to cyclic loading is investigated. Consolidated, constant volume, static (monotonic) and cyclic laboratory shear tests were performed using the Norwegian Geotechnical Institute direct simple shear device, which was modified for cyclic loading capabilities. All cyclic tests were performed with stress controlled square wave loading and most with complete and symmetric stress reversal. Pore pressure is found to be a basic indication of the degradation of a soil specimen subjected to shear. Pore pressure is used directly in predicting the behavior of soil specimens subjected to varying cyclic stress levels. A unique relationship between modulus and pore pressure for a particulr soil subjected to cyclic loading is observed. If the cyclic shear strain at any test parameter combination (cyclic shear stress level and number of cycles) is determined (through constitutive relations or graphically), the resulting pore pressure is also determined from this unique relationship. Dissert. Abstr.

N82-12273# Geological Survey, Washington, D. C.
THE HANDLING, HAZARDS, AND MAINTENANCE OF HEAVY LIQUIDS IN THE GEOLOGIC LABORATORY
Phoebe L. Hauff and Joseph Airey 1980 28 p refs
(USGS-CIRC-827) Avail: NTIS HC A03/MF A01

Data on toxic properties are presented for organic heavy liquids bromoform, methylene iodide, tetrabromoethane, and cleric compounds used for mineral separation processes. The physical properties, hazards of handling, proper storage facilities, and adequate protective clothing are discussed for each compound as well as for their common and less-common solvents. Toxicity data are listed along with exposure symptoms and suggested first aid treatments. Safety for the worker is emphasized. Three reclamation methods which recover the solvent used as a dilutant and purify the heavy liquid are discussed. These include: the water cascade, refluxing-distillation-condensation, and flash evaporation methods. Various techniques for restoration and stabilization of these heavy liquids are also included. S.L.

N82-12274# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
A ONE-DIMENSIONAL PLANE WAVE PROPAGATION CODE FOR LAYERED RATE-DEPENDENT HYSTERETIC MATERIALS Final Report, Nov. 1979 - Sep. 1981
John O. Curtis Sep. 1981 95 p refs
(DA Proj. 4A1-61101-A9-1D)
(AD-A105241; WES/MP/SL-81-25) Avail: NTIS HC A05/MF A01 CSCL 08/13

Recent experimental data on soils showing that the application of loads with submillisecond rise times results in significant rate-dependent compressibility behavior have prompted the need for a one-dimensional plane wave propagation code for layered rate-dependent hysteretic or visco-compacting materials. An explicit one-dimensional finite element code--named ONED3P--was developed which incorporates a three-parameter (spring and dashpot) mechanical model consisting of a linear spring and dashpot in series coupled in parallel with a piecewise linear hysteretic or compacting spring. ONED3P allows for analysis of a column of multilayered visco-compacting soils loaded by a digitized surface pressure-time history. Any set of consistent units may be used with this code and results may be obtained in the form of stress-, strain-, acceleration-, velocity-, and/or displacement-time histories as well as stress-strain curves using standard Calcomp software. Several demonstration problems were calculated using ONED3P to evaluate its features and capabilities against (a) available analytical solutions for viscous and nonviscous problems, (b) other code solutions, and (c) measurements from field experiments that evince rate-dependent soil behavior. In general, results were extremely good. Special attention was given to the effects of loading rate or frequency on wave speeds in viscous media and to methods of deriving the ONED3P model parameters from laboratory material property test data. Program listings and a user's guide are included. GRA

N82-12275# Bendix Corp., Kansas City, Mo.
METAL-FINISHING PROCESSES: SURFACE-FINISH IMPROVEMENT
Laroux K. Gillespie Aug. 1981 49 p Submitted for publication
(Contract DE-AC04-76DP-00613)
(DE81-030188; BDX-613-2578) Avail: NTIS HC A03/MF A01

The role finishing operations play in the manufacture of parts, some basic concepts of surface characteristics, surface improvement processes, and the technical challenges posed by surface finish requirements are addressed. DOE

N82-12276# California Univ., Berkeley. Lawrence Berkeley Lab.
ENERGY EFFICIENCY BUILDINGS PROGRAM Annual Report
May 1981 76 p refs
(Contract W-7405-eng-48)
(DE81-028050; LBL-11985) Avail: NTIS HC A05/MF A01

Progress is reported in developing techniques for auditing the energy performance of buildings. The ventilation of buildings and indoor air quality is discussed from the viewpoint of (1) combustion generated pollutants; (2) organic contaminants; (3) radon emanation, measurements, and control; (4) strategies for the field monitoring of indoor air quality; and (5) mechanical ventilation systems using air-to-air heat exchanges. The development of energy efficient windows to provide optimum daylight with minimal thermal losses in cold weather and minimum thermal gain in hot weather is considered as well as the production of high frequency solid state ballasts for fluorescent lights to provide more efficient lighting at a 25% savings over conventional core ballasts. Data compilation, analysis, and demonstration activities are summarized. DOE

N82-12277# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
MIDWAY HOUSE-TIGHTENING PROJECT: A STUDY OF INDOOR AIR QUALITY
Francis J. Offermann, John R. Girman, and Craig D. Hollowell May 1981 30 p refs
(Contract W-7405-eng-48)
(DE81-030886; LBL-12777) Avail: NTIS HC A03/MF A01

Effects leakage areas and average concentrations of nitrogen dioxide, formaldehyde, and radon, were measured in 12 houses before and after special house-tightening retrofits. The average reduction in leakage area resulting from these retrofits was 32%. None of the pollutants measured before or after the retrofits reached levels exceeding existing guidelines. The moderate increases in radon and formaldehyde concentrations observed are consistent with what could be expected from the estimation average decrease in air-exchange rates. Because the pre- and post-retrofit measurement involved only single, relatively short-term samples taken two months aparts, uncertainties associated with the variability of source strength and occupant activities affecting ventilation remain and preclude any definitive conclusions. DOE

N82-12278# Aerospace Corp., El Segundo, Calif. Energy and Resource Div.
SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB): REQUIREMENTS DEFINITION AND IMPACT ANALYSIS-2. VOLUME 1: ENERGY-CONSERVING DESIGN FOR RESIDENTIAL STRUCTURES
C. K. Cretcher Nov. 1980 140 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 553-2)
(DE82-900206; EPRI-EM-1506-Vol-1) Avail: NTIS HC A07/MF A01

The impact of stringent energy conserving building standards on electric utility service areas and their customers was analyzed. The demands on the seven broadly representative electric utilities were aggregated to represent the total new construction electric heating demands in the years 1990 and 2000 to be compared to the aggregate obtained similarly for a nominal, less stringent standard, viz., ASHRAE 90-75. Results presented include the percentage of energy savings achieved in both heating and cooling seasons and typical demand profile changes. A utility economic impact analysis was performed for the cases investigated to determine changes in operating costs and potential capacity sales.

A third cost component considered is the incremental cost of superinsulation (over ASHRAE 90-75) to the customer. The aggregate net cost to the utility/customer entity is utilized as a measure of overall economic benefit. DOE

N82-12279# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.

SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB): REQUIREMENTS DEFINITION AND IMPACT ANALYSIS-2. VOLUME 2: DOMESTIC HOT WATER SYSTEMS

C. K. Cretcher Nov. 1980 121 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 553-2)
(DE82-900207; EPRI-EM-1506-Vol-2) Avail: NTIS HC A06/MF A01

The various types of solar domestic hot water systems are discussed including their advantages and disadvantages. The problems that occur in hydronic solar heating systems are reviewed with emphasis on domestic hot water applicatons. System problems in retrofitting of residential buildings are also discussed including structural and space constraints for various components and subsystems. System design parameters include various collector sizing methods, collector orientation, storage capacity and heat loss from pipes and tanks. The installation costs are broken down by components and subsystems. The approach used for utility economic impact analysis is reviewed. The simulation is described, and the results of the economic impact analysis are given. A summary assessment is included. DOE

N82-12280# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.

SOLAR HEATING AND COOLING OF BUILDINGS (SHACOB): REQUIREMENTS DEFINITION AND IMPACT ANALYSIS-2. VOLUME 3: CUSTOMER LOAD MANAGEMENT SYSTEMS

C. K. Cretcher and R. C. Rountredd Nov. 1980 87 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 553-2)
(DE82-900208; EPRI-EM-1506-Vol-3) Avail: NTIS HC A05/MF A01

Customer Load Management Systems, using off-peak storage and control at the residences, are analyzed to determine their potential for capacity and energy savings by the electric utility. Areas broadly representative of utilities in the regions around Washington, DC and Albuquerque, NM were of interest. Near optimum tank volumes were determined for both service areas, and charging duration/off-time were identified as having the greatest influence on tank performance. The impacts on utility operations and corresponding utility/customer economics were determined in terms of delta demands used to estimate the utilities' generating capacity differences between the conventional load management, (CLM) direct solar with load management (DSLM), and electric resistive systems. Energy differences are also determined. These capacity and energy deltas are translated into changes in utility costs due to penetration of the CLM or DSLM systems into electric resistive markets in the snapshot years of 1990 and 2000. DOE

N82-12281# Oak Ridge Y-12 Plant, Tenn. Dept. of Fabrication Systems.

CONTROL SYSTEMS IMPROVEMENTS IN A PRECISION COORDINATE MEASURING MACHINE

S. S. Douglass, E. F. Babelay, Jr., R. E. Igou, L. M. Woodard, and W. L. Green Sep. 1981 17 p refs
(Contract W-7405-eng-26)
(DE82-000024; Y-2249) Avail: NTIS HC A02/MF A01

A conventional, manually driven Moore No. 3 coordinate measuring machine at the Oak Ridge Y-12 Plant is being upgraded to provide a continuous-path numerical control capability and simultaneously serve as a vehicle for testing new machine slide-control concepts. Besides new lead screw drive motors, an NC machine control unit, and a closed-loop servo system, the machine has also been equipped with vibration isolation, air-bearing slideways, and laser interferometric position feedback. The present conventional slide servo system will be replaced with a digital servo system wherein various feedback and compensation techniques can be realized through the use of a high speed, dedicated digital processor. The improvements to data are described with emphasis on identification and compensation of the slide control systems. GRA

N82-12282# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

INTERIOR DESIGN FOR PASSIVE SOLAR HOMES

Jill C. Breen Jul. 1981 7 p refs Presented at the 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-027939; SERI/TP-721-1312; CONF-810925-10) Avail: NTIS HC A02/MF A01

The increasing emphasis on refinement of passive solar systems brought recognition to interior design as an integral part of passive solar architecture. Interior design can be used as a finetuning tool minimizing many of the problems associated with passive solar energy use in residential buildings. In addition, treatment of interior space in solar model homes may be a prime factor in determining sales success. A new style of interior design is evolving in response to changes in building from incorporating passive solar design features. The psychology behind passive solar achitecture is reflected in interiors, and selection of interior components increasingly depends on the functional suitably of various interior elements. DOE

N82-12283# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

COMPARISON OF RESIDENTIAL WINDOW DISTRIBUTIONS AND EFFECTS OF MASS AND INSULATION

M. Hannifan, C. Christensen, and R. Perkins Jul. 1981 7 p refs Presented at the 6th National Passive Solar Conf., Portland, Oreg. 8-12 Sep. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-027938; SERI/TP-721-1300; CONF-810925-9) Avail: NTIS HC A02/MF A01

The energy requirements and comfort implications of various window distributions and window areas (representing conventional, sun-tempered, and passive solar designs) are investigated for single-family residences in Albuquerque, NM, Denver, CO, and Madison, WI. Three distinct mass levels ranging from lightweight to heavyweight interiors and three distinct insulations levels, including energy-conserving, night-insulated, and superinsulated cases, are analyzed. Energy requirements are reported for residences with electric resistance heating and mechanical air conditioning. Comfort conditions reported are based on interior average air temperatures and mean-squared errors. DOE

N82-12284# Los Alamos Scientific Lab., N. Mex.

MATERIALS FOR MAGNETIC REFRIGERATION BETWEEN 2 AND 20 K

J. A. Barclay and W. A. Steyert May 1981 24 p refs
(Contract W-7405-eng-36)
(DE81-024031; LA-8746-MS) Avail: NTIS HC A02/MF A01

As part of a research and development program on magnetic refrigeration, paramagnetic materials suitable for magnetic refrigeration in the 2 to 20 K range were studied for the Jet Propulsion Laboratory. The best materials with known properties, as derived from a literature survey, are plotted. For one of those materials, gadolinium gallium garnet, the results are presented of field-dependent heat capacity measurements. Preparation and fabrication of gadolinium compounds are discussed briefly as well as the scope of further work for selecting and studying working materials for magnetic refrigeration. DOE

N82-12285# STEAG A.G., Essen (West Germany). Zentralbereich Forschung und Entwicklung.

NEW BUILDING MATERIALS. A CONTRIBUTION TO ENVIRONMENTAL PROTECTION. SUBPROJECT: FLY ASH CEMENT Final Report

Dieter Deuster Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 138 p refs In GERMAN; ENGLISH summary Sponsored by Forschung und Technologie
(BMFT-FB-T-80-176; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 29

Fly ash cement was developed from a mixture of Portland cement and fly ash as a hydraulic binding agent. In laboratory investigations, fly ash cement was produced by homogenizing

Portland cement, clinkers, and fly ash as well as by grinding Portland cement, clinkers, gypsum and fly ash together. The experiments indicate that grinding the components together gives higher compressive strength than grinding separately, followed by homogenizing. Investigations were conducted in which the fly ash cement was produced by grinding the components together with a fly ash content of 30% by weight. This cement meets specifications and fits into the range of the cement standard DIN 1164. For the Federal Republic of Germany, it is officially permitted for the first time for construction purposes as fly ash cement, designated as FAZ 35 F. Author (ESA)

N82-12286# Centre Technique des Industries Mecaniques, St. Etienne (France).
SIMULATION OF THE FLOW DURING STAMPING: CHARACTERISTICS AND APPLICATION OF MODELING CLAY USED FOR SIMULATION OF MATERIAL FLOW IN A FORGE Final Report [SIMULATION DES ECOULEMENTS EN ESTAMPAGE]
S. Jacomet, H. J. Braudel, J. L. Chenot, and Sophia Antipolis (CEMEF) 9 Mar. 1981 60 p In FRENCH
(Contract CEMEF-4.79.7465)
(CETIM-1.3K.28.2) Avail: NTIS HC A04/MF A01

Information is given on the design of experiments where material flow during a stamping process is simulated. The choice of modeling clay is discussed, relating to seven different types. Rheological tests in order to characterize the modeling clays are described. The preparation of specimens is explained. The mechanical equipment necessary for stamping simulation is determined. Author (ESA)

N82-12287# Earthquake Engineering Research Inst., Berkeley, Calif.
MODELLING OF SOIL-STRUCTURE INTERACTION BY FINITE AND INFINITE ELEMENTS Ph.D. Thesis
Francisco Medina Dec. 1980 68 p refs Sponsored in part by Chile Univ., Santiago and Organization of American States (Grants NSF ENV-76-04264; NSF PFR-79-08261)
(PB81-229270; UCB/EERC-80/43; NSF/RA-800548) Avail: NTIS HC A04/MF A01 CSCL 13M

A direct method for solving dynamically excited structures on elastic semi-infinite media is suggested as an improvement over available approaches. The method consists in modeling the near field with finite elements and the far field with infinite elements. The method falls within the framework of the classical finite element method and preserves its flexibilities. The key to the success of the proposed method is the proper definition of the infinite element shape functions. An axisymmetric infinite element is developed to solve three dimensional wave propagation problems in cylindrical orthotropic, elastic, unbounded continua. The element is capable of propagating Rayleigh, shear and compressional waves in the frequency domain. A scheme to numerically integrate the element characteristic matrices is formulated based upon Gauss-Laguerre quadrature. GRA

N82-12288# Sydney Univ. (Australia). Civil Engineering Labs.
SOME ASPECTS OF SKIN FRICTION OF PILES IN CLAY UNDER CYCLIC LOADING
H. G. Poulos Dec. 1980 33 p refs Sponsored in part by the Australian Research Grants Committee and the Univ. of Sydney (PB81-226730; R-379) Avail: NTIS HC A03/MF A01 CSCL 13B

A number of mode tests on a pile shaft in clay were performed to investigate the influence of cyclic loading on the ultimate skin friction. It is found that the loss of skin friction due to cyclic loading depends on both the cyclic displacement prior to failure and the number of cycles of load. Such loss of skin friction can occur both for one way or two way cyclic loading. The cyclic stiffness of the pile depends on the cyclic displacement of the pile. The rate of loading also influences the skin friction but does not appear to influence the stiffness of the pile. GRA

N82-12111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DYNAMICS OF SUPERFLUID HELIUM IN ZERO GRAVITY
Peter V. Mason *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 18-24 ref (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20L

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-12289 California Univ., Los Angeles.
UNIFICATIONS AND EXTENSIONS OF THE MULTIPLE ACCESS COMMUNICATIONS PROBLEM Ph.D. Thesis
Mart Lauri Molle 1981 138 p
Avail: Univ. Microfilms Order No. 8121012

Multiple access protocols permit a broadcast communications channel to be shared by a large number of stations under distributed control. It is assumed that only one message at a time can be transmitted successfully over the common channel. A local optimality condition for synchronous multiple access protocols was derived and it is shown that many known protocols are special cases of this condition. A survey of much of the recent work on infinite population tree algorithms that use the history of channel activity to carry out short-range dynamic scheduling is included. An approach is presented for deriving upper bounds on the maximum stable throughput with finite average delay for infinite population protocols. Dissert. Abstr.

N82-12290 Washington Univ., Seattle.
MODELING AND PERFORMANCE OPTIMIZATION OF LARGE-SCALE DATA-COMMUNICATION NETWORKS Ph.D. Thesis
Francis D. Gorecki 1981 159 p
Avail: Univ. Microfilms Order No. 8121200

A theory of modeling, analysis, and performance optimization is developed and illustrated for large-scale, data communication networks. In a novel and significant departure from existing problem formulations, channel and network models are presented which include the effects of channel distortion, nodal processing errors, and protocol dependent errors. All of these effects are of critical importance in practice, but cannot be readily incorporated into other models. Information theoretic techniques are developed and used to characterize network capacity and message integrity as a function of protocols, routing policies, channel capacity assignment, and channel distortion. Flow assignment techniques which optimize network performance with respect to certain classes of physically important performance matrices are formulated and employed to derive centralized and distributed routing algorithms. Dissert. Abstr.

N82-12291 Rensselaer Polytechnic Inst., Troy, N. Y.
A COMBINED SOURCE-CHANNEL CODING APPROACH TO IMAGE TRANSMISSION Ph.D. Thesis
David George Daut 1981 410 p
Avail: Univ. Microfilms Order No. 8121141

A combined source-channel coding approach is described for the encoding, transmission, and remote reconstruction of image data. Several two dimensional image source encoding schemes are considered. Each source encoding technique is relatively efficient in the absence of channel errors. In the presence of channel errors, however, system performance degrades rapidly. By providing error control protection to those encoded bits which contribute most significantly to image reconstruction, it is possible to minimize this degradation without sacrificing transmission bandwidth. The result is a relatively robust overall system design which is reasonably insensitive to channel errors and yet provides performance approaching the rate distortion bound. Dissert. Abstr.

N82-12292 California Univ., Los Angeles.
ANALYSIS OF NONCOHERENT MULTIPLE ACCESS COMMUNICATION CHANNELS Ph.D. Thesis
Ronald Eugene Sorace 1981 149 p
Avail: Univ. Microfilms Order No. 8122849

A number of users simultaneously transmitting M-ary

frequency shift keying signals via a multiple access channel to a receiver are considered. The two types of noncoherent detectors considered for each of the M orthogonal frequencies are a binary hard decision single threshold detector and a multilevel soft decision detector. After presentation of a random coding bound for block codes, a random coding bound for a hybrid convolutional coding scheme using a super Viterbi decoder is given. This latter notion is contrasted to independent user decoding. The convolutional coding system is studied for two types of noise which are particularly detrimental to multiple access communication. Various combinatorial expressions to facilitate performance computations are presented. Emphasis is given to the hard decision scheme, since the reduced information at the receiver renders this situation more difficult. A closely related pulse position modulation laser communication system with multiple access is also examined. Dissert. Abstr.

N82-12293 Northeastern Univ., Boston, Mass.
BANDWIDTH CONSTRAINED SIGNAL DESIGN FOR DIGITAL COMMUNICATION OVER RAYLEIGH FADING CHANNELS AND PARTIAL BAND INTERFERENCE CHANNELS Ph.D. Thesis
Iftekhar Rahman 1981 320 p
Avail: Univ. Microfilms Order No. 8122612

Signal design techniques involving bandwidth efficient coding and modulation are investigated for Rayleigh fading channels and partial band interference channels, and several aspects of the design problem are discussed. Performance is evaluated by deriving upper bounds to the bit error rates as a function of the bit signal to noise ratio and with a bandwidth constraint. Single level codes and concatenated codes are treated. Hard decision decoding and unquantized soft decision decoding are evaluated and compared. Several signal designs are compared and conclusions drawn regarding their relative efficiency. A more general approach to the design problem is then taken by deriving the capacity and computational cut-off rate limits. These limits are then used to obtain performance bounds for the existing codes. Finally, it is discussed how one may in practice use the results to design efficient waveforms, from a basic set of FSK-type (bandwidth limted) signals, for reliable communication over Rayleigh Fading channels. Dissert. Abstr.

N82-12294 California Univ., Los Angeles.
MESSAGE QUEUEING DELAYS IN POLLING SCHEMES WITH APPLICATIONS TO DATA COMMUNICATION NETWORKS Ph.D. Thesis
Luis Felipe M. deMoraes 1981 241 p
Avail: Univ. Microfilms Order No. 8120941

Polling multiple-access schemes, which are intended to provide the coordination and efficient share of communication facilities among the several users of a network, are presented and analyzed. Two polling disciplines, the gated and exhaustive, under which the terminals are polled in a cyclic fashion, are considered and studied. A polling scheme with positional priorities is also introduced. By noting the several similarities between this last and a TDMA scheme, where the messages at each terminal can belong to several priority levels, results for such a TDMA scheme are also obtained. Finally, another polling procedure, which employs reservation polling (probing) time periods during which busy terminals are identified, is introduced and analyzed. The performance index used in analyses consists of the message waiting time. The analyses are carried out within a queueing theoretic framework for network terminals modeled as independent sources, which generate messages according to a renewal process. An analytical technique, which employs a Markov ratio limit theorem is presented for the derivation of performance parameters. Dissert. Abstr.

N82-12295 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MULTIPLE ARRESTED SYNTHETIC APERTURE RADAR Ph.D. Thesis
Jerrold Stuart Shuster 1981 296 p
Avail: Univ. Microfilms Order No. 8119140

A radar (MASAR) for the detection of slowly moving targets in clutter was analytically conceptualized and evaluated. The radar consists of a succession of synthetic aperture antennas which are coincident in space but are displaced in time by several interpulse periods. The radar is evaluated using the target to clutter power ratio as the measure of performance. The radar is assumed to be clutter power limited, so noise is ignored in the evaluation. The evaluation consists of a comparison between three different receiver processing schemes. The first processor is a set of weights which optimizes the target to clutter power ratio and is the central feature of MASAR. The second processor is a set of weights comprising the target signal, itself; it is shown to be optimum for rapidly decorrelating clutter. The third processor is set of binomial weights; effectively, it reduces the system to an n-pulse canceller which, for a two antenna system, is the well known displaced phase center antenna (DPCA) radar. Dissert. Abstr.

N82-12296 Colorado Univ. at Boulder.
EFFICIENT STRUCTURE, AND ALGORITHMS FOR DIGITAL SIGNAL PROCESSING Ph.D. Thesis
Masud M. Arjmand 1981 260 p
Avail: Univ. Microfilms Order No. 8122266

Algorithms and structures for specific signal processing problems that effectively utilize the capabilities offered by modern integrated circuit technology are developed. Several parameters that determine whether or not a given algorithm and its resultng hardware structure is efficient are studied. Among these parameters are finite wordlength effects, computational and hardware complexity (measured in the form of chip area of an implementation), speed of operation or data throughput, modularity and regularity. The definition of an efficient algorithm is determined by the technology used to implement that algorithm. Some of the factors that influence the development of very large scale integration algorithms for signal factors for signal processing are discussed. Three major areas of signal processing, namely, linear filtering, noncyclic convolution and Fourier transformation are considered. Dissert. Abstr.

N82-12297* National Aeronautics and Space Administration. Pasadena Office, Calif.
REAL-TIME MULTIPLE-LOOK SYNTHETIC APERTURE RADAR PROCESSOR FOR SPACECRAFT APPLICATIONS Patent
Chialin Wu (JPL, California Inst. of Technology, Pasadena) and Vance C. Tyree, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Issued 29 Sep. 1981 13 p Filed 15 Dec. 1978 Supersedes N79-14278 (17 - 05, p 0585) Sponsored by NASA
(NASA-Case-NPO-14054-1; US-Patent-4,292,634; US-Patent-Appl-SN-969761; US-Patent-Class-343-5CM) Avail: US Patent and Trademark Office CSCL 17I

A spaceborne synthetic aperture radar (SAR) having pipeline multiple-look data processing is described which makes use of excessive azimuth bandwidth in radar echo signals to produce multiple-looking images. Time multiplexed single-look image lines from an azimuth correlator go through an energy analyzer which analyzes the mean energy in each separate look to determine the radar antenna electric boresight for use in generating the correct reference functions for the production of high quality SAR images. The multiplexed single look image lines also go through a registration delay to produce multi-look images.
Official Gazette of the U.S. Patent and Trademark Office

N82-12298*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A PIPELINED DIGITAL SAR AZIMUTH CORRELATOR USING HYBRID FFT/TRANSVERSAL-FILTER Patent Application
Chialin Wu (JPL, California Inst. of Technology, Pasadena) and Kuang Y. Liu, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Filed 26 Oct. 1981 41 p
(Contract NAS7-100)
(NASA-Case-NPO-15 19-1; US-Patent-Class-314-928) Avail: NTIS HC A03/MF A01 CSCL 17I

A pipe lined digital signal processor for producing real time high resolution synthetic aperture radar (SAR) images is described. The hybrid processor is comprised of a fast Fourier transform for correlation in the SAR response in the range direction. S.L.

N82-12299# Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.

AN EVALUATION OF THE PERFORMANCE OF 12 GHz LOW COST TVRO TERMINALS IN NORTHWESTERN ONTARIO
R. W. Huck and E. L. Perrier Aug. 1981 79 p
(CRC-1345) Avail: NTIS HC A05/MF A01

The technical performance of low cost terminals over a long period, the ability of users to operate the terminals, and the acceptability of the signals received from Anik B were assessed at 25 of the 43 terminals installed in Northwestern Ontario, to receive programs of the Ontario Educational Communications Authority. The procedures used to make the on-site measurements are described. Results are summarized and analyzed for the following: (1) polarization angle error; (2) antenna pointing errors; (3) noise figures; (4) carrier-to-noise ratio and signal-to-noise ratio; (5) baseband distortions; (6) IF bandpass response and AFC operation; and (7) remodulator response. A.R.H.

N82-12300*# Rensselaer Polytechnic Inst., Troy, N. Y.
FORMULATION OF A DYNAMIC ANALYSIS METHOD FOR A GENERIC FAMILY OF HOOP-MAST ANTENNA SYSTEMS Progress Report
A. Gabriele and R. Loewy 2 Nov. 1981 18 p refs
(Grant NAG1-171)
(NASA-CR-164981) Avail: NTIS HC A02/MF A01 CSCL 20N

Analytical studies of mast-cable-hoop-membrane type antennas were conducted using a transfer matrix numerical analysis approach. This method, by virtue of its specialization and the inherently easy compartmentalization of the formulation and numerical procedures, can be significantly more efficient in computer time required and in the time needed to review and interpret the results. R.J.F.

N82-12301*# Environmental Research and Technology, Inc., Concord, Mass.
HANDBOOK FOR THE ESTIMATION OF MICROWAVE PROPAGATION EFFECTS: LINK CALCULATIONS FOR EARTH-SPACE PATHS (PATH LOSS AND NOISE ESTIMATION)
Robert K. Crane and David W. Blood Jun. 1979 88 p refs (Contract NAS5-25341)
(NASA-CR-165002; TR-1; P-7376-TR1) Avail: NTIS HC A05/MF A01 CSCL 20/14

A single model for a standard of comparison for other models when dealing with rain attenuation problems in system design and experimentation is proposed. Refinements to the Global Rain Production Model are incorporated. Path loss and noise estimation procedures as the basic input to systems design for earth-to-space microwave links operating at frequencies from 1 to 300 GHz are provided. Topics covered include gaseous absorption, attenuation by rain, ionospheric and tropospheric scintillation, low elevation angle effects, radome attenuation, diversity schemes, link calculation, and receiver noise emission by atmospheric gases, rain, and antenna contributions. N.W.

N82-12302# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
PROMPT DETECTION OF AIRCRAFT MANEUVERS BY USE OF RANGE RATE RADAR DATA Final Report
James A. Shannon Aug. 1981 46 p
(AD-A105063; FAA-RD-81-62) Avail: NTIS HC A03/MF A01 CSCL 17/9

In addition to the usual range and bearing information concerning aircraft targets, the next generation of long range radars can have the capability of measuring directly a component of velocity. An investigation was conducted to determine first, the accuracy with which target velocity can be measured and secondly, how these velocity data can be exploited so as to better predict aircraft position. A B727 was flown in a special pattern, which included many maneuvers, at a distance of about 100 nmi from a prototype of the velocity measuring radar. The standard deviation of the measurement of the component of velocity was found to be less than 1.3 knots. The velocity data from the test flight were subjected to processing by a tracker which calculates changes in aircraft heading from changes in velocity component. The results are promising. In all maneuver were immediately detected and the velocity vectors constructed by the tracker followed closely the vectors flown by the aircraft. The benefical consequences of incorporating a tracker using velocity data are pointed out. An example is given comparing the automatic of a potential conflict using the conventional tracker and then the tracker which processes velocity data. In the example the use of such data is vital to a safe resolution. GRA

N82-12303# Federal Aviation Administration, Atlantic City, N.J.
MOVING TARGET DETECTOR/AIRPORT SURVEILLANCE RADAR (ASR-7) FIELD EVALUATION Final Report, Feb. 1979 - Jan. 1980
W. Goodchild Aug. 1981 52 p refs
(AD-A105196; FAA-CT-81-31; FAA-RD-81-57) Avail: NTIS HC A04/MF A01 CSCL 17/7

The Moving Target Detector (MTD) II, a sophisticated radar processor, was evaluated to determine its capability to provide improved radar detection in an air traffic control (ATC) environment. The MTD II was installed on one channel of an airport surveillance radar (ASR-7) at Burlington, Vermont. The major objective of testing was to compare the performance of the MTD II with that of the ASR-7 Moving Target Indicator (MTI). This report concentrates on the comparative probability of detection, false alarm rate, MTI improvement factor, subclutter visibility, dynamic range, velocity response, and the simultaneous flight test results of the two systems. Comparison of the MTD II to the MTD I system is made when necessary to show major improvements or deficiencies in the MTD II design. The results of the tests have shown that the MTD II provides surveillance capabilities superior to those of the ASR-7/MTI. Author (GRA)

N82-12304# Federal Aviation Administration, Atlantic City, N.J.
COLUMBUS, OHIO, VOICE RESPONSE SYSTEM DEMONSTRATION AND EVALUATION Final Report, Dec. 1979 - Apr. 1980
John C. Henline Jun. 1981 54 p
(FAA Proj. 131-402-854)
(AD-A104750; FAA-CT-80-50; FAA-RD-81-20) Avail: NTIS HC A04/MF A01 CSCL 17/2

The Voice Response System (VRS) was subjected to a 4-month demonstration in the Columbus, Ohio, Flight Service Station (FSS) preflight area. The purpose of the experiment was to test and evaluate the VRS system, user acceptance, and the effects on the specialists/facility workload, and to determine the general impact of VRS on the Columbus (CMH) FSS preflight area. In addition, the test permitted collection of technical performance data which could serve as the framework for an integrated national system for the mass dissemination of weather information. It is concluded that the VRS caused a shift in user demand/preference, reduced FSS briefer workload, reduced demand for basic pilots automatic telephone weather answering service (PATWAS), and was determined to be acceptable to the general aviation user. Author (GRA)

N82-12305# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
OPTICAL PROCESSING FOR ADAPTIVE PHASED ARRAY RADAR Final Technical Report, 1 Jan. - 31 Dec. 1980
David Casasent Jun. 1981 193 p refs
(Contract F30602-80-C-0048; AF Proj. 2304)
(AD-A105124; RADC-TR-81-152) Avail: NTIS HC A09/MF A01 CSCL 17/9

Three new optical signal processing techniques for adaptive phased array radar (APAR) signal processing are described. The coherent optical correlator uses acousto-optic transducers and computes the far-field noise distribution of the antenna. Digital post-processing is then used to compute the adaptive weights from this information. A new hybrid time and space integrating optical signal processing architecture is advanced and a new adjunct antenna concept is introduced for this processor. Initial acousto-optic experimental results and initial simulations are advanced. An electronic support system and the necessary post-processing issues are described. The second technique uses an input LED array and fiber optic interconnections with a linear photo detector to realize a vector-matrix processor. With the addition of an electronic feedback system, an iterative optical processor results. This system computes the set of adaptive weights given the covariance matrix of the noise field and the desired steering vector. The design and performance of the system fabricated and its use in an APAR signal processing are described. A new wavelength diversity processor concept for the iterative

optical processor is described in many new algorithms and potential applications of the system are provided. Author (GRA)

N82-12306# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

COMPARATIVE STUDY OF NONLINEAR TIME WARPING TECHNIQUES IN ISOLATED WORD SPEECH RECOGNITION SYSTEMS

A. Waibel and B. Yegnanarayana 17 Jun. 1981 60 p refs (Contract F33618-78-C-1551; ARPA Order 3597; Grant NSF MCS-78-25825)

(AD-A104865; CMU-CS-81-125) Avail: NTIS HC A04/MF A01 CSCL 09/2

In this paper we present the description of an isolated word recognition system and a discussion of various design choices that affect its performance. In particular, we report experimental results aimed at evaluating several methods to optimize the performance of dynamic warping algorithms. Three major aspects that have been suggested have been investigated: relaxation of the boundary conditions to allow for inaccurate begin-end time detection; choice of warping algorithm, e.g., Itakura asymmetric, Sakoe and Chiba symmetric, Sakoe and Chiba asymmetric; and choice of an appropriate warping window to restrict computation to a minimum needed for best recognition results. Recognition results were tested on two vocabularies: the digits and a highly confusable subset of the alphabet (e.g., e, b, d, p, t, g, v, c, z). The relaxation of the boundary conditions degraded the performance of the confusable subset and the digits. The asymmetric Itakura algorithm yielded better results for the confusables, while we obtained slightly better results for the digits using the symmetric Sakoe and Chiba algorithm. The choice of a 100-ms warping window appears to be optimal for both vocabularies used. Author (GRA)

N82-12307# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

EFFECT OF REFERENCE SET SELECTION ON SPEAKER DEPENDENT SPEECH RECOGNITION: FRAME COMPRESSION IN ISOLATED WORD RECOGNITION

Zongge Li, Fil Alleva, and Raj Reddy 23 Jul. 1981 18 p refs

(Contract F33615-78-C-1551; Grant NSF MCS-78-25824; ARPA Order 3597)

(AD-A104794; CMU-CS-81-134) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes an algorithm for compressing the spectral representation of an utterance along the time axis while keeping the main features intact. The goal of the algorithm is to save template storage space and to reduce the time required for recognition. For 8 speakers, 5 data sets each, the results indicated that we can save about 40% of the template space and 35% of the recognition time with only a slightly higher error rate.

Author (GRA)

N82-12308# Naval Research Lab., Washington, D. C.

RADAR IMAGING FROM A DISTORTED ARRAY

B. D. Steinberg 13 Oct. 1981 24 p refs (WF12100000)

(AD-A104803; NRL-MR-4646) Avail: NTIS HC A02/MF A01 CSCL 17/9

High angular resolution radar imaging may be achieved with a large-aperture antenna even if the aperture is distorted, provided that adaptive signal processing compensates for the distortion. An algorithm for imaging ground-based targets is described and experimental results are given for a 3 cm wavelength demonstration system using a distorted 27 m, random, sparse array. The measured beamwidth of one mr conformed to theory, confirming the validity of the technique. Extension of the algorithm to accommodate isolated targets such as aircraft and ships also is discussed. Author (GRA)

N82-12309# Naval Research Lab., Washington, D. C.

ESTIMATION OF BIAS ERRORS IN ANGLE-OF-ARRIVAL MEASUREMENTS USING PLATFORM MOTION Interim Report

A. Grindlay 28 Aug. 1981 17 p refs (RR0210541)

(AD-A104742; NRL-8512) Avail: NTIS HC A02/MF A01 CSCL 17/3

An algorithm has been developed to estimate the bias errors in angle-of-arrival measurements made by electromagnetic detection devices on-board a pitching and rolling platform. The algorithm assumes that continuous exact measurements of the platform's roll and pitch conditions are available. When the roll and pitch conditions are used to transform deck-plane angular measurements of a nearly fixed target's position to a stabilized coordinate system, the resulting stabilized coordinates (azimuth and elevation) should not vary with changes in the roll and pitch conditions. If changes do occur they are a result of bias errors in the measurement system and the algorithm which has been developed uses these changes to estimate the sense and magnitude of angular bias errors. Author (GRA)

N82-12310# Messina Univ. (Italy). Inst. de Struttura Della Materia.

MULTIPLE ELECTROMAGNETIC SCATTERING FROM A CLUSTER OF SPHERES. VOLUME 1: THEORY Special Report, Jun. 1979 - Sep. 1980

F. Borghese, P. Denti, and O. I. Sindoni Aberdeen Proving Ground, Md. Army Armament Research and Development Command Sep. 1981 21 p refs

(Grant DA-ERO-78-G-106)

(AD-A105453; ARCSL-SP-81008) Avail: NTIS HC A02/MF A01 CSCL 20/6

A method to calculate the electromagnetic scattering properties of a cluster of spheres of arbitrary radii and possibly complex refractive indexes is proposed. The suggested approach takes into account multiple scattering effects and does not require any approximation except for the truncation of the multipolar expansions describing the scattered field. Author (GRA)

N82-12311# Notre Dame Univ., Ind. Dept. of Electrical Engineering.

NEW APPROACH TO SPEECH DIGITIZATION COMBINING TIME-DOMAIN HARMONIC SCALING AND ADAPTIVE RESIDUAL CODING Final Report, Oct. 1980 - Aug. 1981

James L. Mels and Arun K. Pande 31 Aug. 1981 174 p refs

(Contract DCA100-80-C-0050)

(AD-A105383) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report describes the results of a twelve-month study, supported under DCA Contract 100-80-C-0050, of a new speech digitization algorithm combining Time-Domain Harmonic Scaling (TDHS) and Adaptive Reidual Coding (ARC). The FORTRAN simulation of this system conducted as part of this study produces high quality speech reproduction at mediumband bit rates of 9.6 kb/s and 16 kb/s. This system also displays excellent robustness characteristics for channel bit error rates as high as 1% and for acoustic background noise. By basing the required pitch extraction on a three-level clipped signal, the hardware requirements for the system are kept modest. The combined algorithm has several features which become significant in a fuel system applications. Because the algorithm is a high performance, waveform matching algorithm, extremely good pervformance in the random configuration with other algorithms is anticipated. Since the technique is basically a waveform reconstruction technique, it will perform well on non speech signals such as in-band signaling and modem tones.

Author (GRA)

N82-12312# Joint Publications Research Service, Arlington, Va. Foreign Technology Div.

ANTENNA

15 Oct. 1981 101 p refs Transl. into ENGLISH from Antenny (USSR), no. 13, 1971 p 3-48 and 56-70

(AD-A106521; FTD-ID(RS)T-0943-81) Avail: NTIS HC A06/MF A01 CSCL 20/14

Various investigations of antenna design and operation are presented. The design of phased annular antenna arrays of interacting radiators excited by a Butler circuit is discussed. The critical wave number and wave resistance of a coaxial line with a cross-shaped interior conductor are determined. In addition, the synthesis of difference direction patterns of spherical antennas is examined and the input resistance of a vibrator with a dielectric cover is calculated by the induced EMF method.

Finally, the calculation of the H-plane stepped joint of rectangular waveguides is discussed. M.G.

N82-12313# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMBINED REPORT NUMBER 22. SATNET DEVELOPMENT AND OPERATION, PLURIBUS SATELLITE IMP DEVELOPMENT, REMOTE SITE MAINTENANCE, INTERNET DEVELOPMENT, MOBILE ACCESS TERMINAL NETWORK, TCP FOR THE HP3000, TCP-TAC, TCP FOR VAX-UNIX Quarterly Technical Report, 1 May 1980 - 30 Jul. 1981
R. D. Bressler Aug. 1981 81 p refs
(Contracts N00039-78-C-0405; MDA903-80-C-0353; MDA903-80-C-0214; N00039-79-C-0386; N00039-80-C-0664; N00039-81-C-0408)
(AD-A104931; BBN-4761) Avail: NTIS HC A05/MF A01 CSCL 17/2

This quarterly technical report describes work on the development of and experimentation with packet broadcast by satellite; on development of Pluribus Satellite IMPs; on a study of the technology of Remote Site Maintenance; on the development of Inter-network monitoring; on shipboard satellite communications; and on the development of Transmission control protocols for the HP3000, TAC, and VAX-UNIX. Author (GRA)

N82-12314# Harry Diamond Labs., Adelphi, Md.
AN ADVANCED 500-MHZ-BANDWIDTH FIBER-OPTIC SIGNAL LINK FOR EMP AND GENERAL LABORATORY APPLICATIONS Technical Report, Sep. 1978 - Nov. 1979
James C. Blackburn Jul. 1981 29 p refs Sponsored in part by Defense Nuclear Agency
(AD-A105118; HDL-TR-1940) Avail: NTIS HC A03/MF A01 CSCL 17/2

Means have been found to control modal noise in a fiber-optic system using single-mode lasers. Laser coherence is reduced by dithering, and careful attention is given to fiber connections. These techniques, in combination with miniaturization, have produced a compact wideband analog fiber-optic link that is well suited to signal transmission where dielectric transmission is dictated by electrical noise, need for complete isolation, TEMPEST considerations, or a requirement for wide bandwidth. The optical transmitter has a volume of 550 cc, contains an optically remote-controlled 0- to 45-dB input attenuator and calibrator, and will operate for 2 hr on its internal batteries. Maximum input sensitivity is a few millivolts into 50 ohms, system risetime in 0.8 ns, and dynamic range is greater than 30 dB. Transmission distances up to kilometers are possible, although fiber dispersion will reduce bandwidth at long distances. Author (GRA)

N82-12315# Scripps Institution of Oceanography, La Jolla, Calif.
THE METHOD OF FRIEMAN AND KROLL FOR THE CALCULATION OF ELECTROMAGNETIC FIELDS AND ITS APPLICATION TO DATA INVERSION
Peter D. Young Sep. 1981 39 p refs
(Contract N00014-75-C-0999; Grant NSF OCE-78-14524)
(AD-A104809; SIO-REF-81-15) Avail: NTIS HC A03/MF A01 CSCL 20/4

The derivation of the method developed by Frieman and Kroll (1973) for the calculation of electromagnetic fields due to a transmitting antenna within a one-dimensional profile of electrical conductivity starts with Maxwell's equations in the charge-rationalized MKS system of units. Author (GRA)

N82-12316# Sandia Labs., Albuquerque, N. Mex. Entry Control Systems Div.
EVALUATION OF ACTIVE AND PASSIVE NEAR-MILLIMETER-WAVE RADIOMETRIC IMAGING TECHNIQUES FOR DETECTION OF CONCEALED OBJECTS
Earl E. Reber, Frank B. Foote, Ralph L. Schellenbaum, and Robert G. Bradley Jul. 1981 21 p refs Prepared in cooperation with Aerospace Corp., Los Angeles
(Contract DE-AC04-76DP-00789)
(DE81-031938; SAND-81-1051) Avail: NTIS HC A02/MF A01

The potential of radiometric imaging technique to detect shielded nuclear materials and explosives carried covertly by personnel was investigated. This method of detecting contraband depends upon the differences in emissivity and reflectivity of the contraband relative to human tissue. Explosives, unlike metals and metal composites, generally have high emissivities and low reflectivities that closely approximate those of human tissue making explosives difficult to detect. Samples of several common types of explosives (TNT, Detasheet, C4, and several types of water gels) were examined at the 1.4- and 3-mm wavelengths using active and passive radiometeric techniques. DOE

N82-12317# Sandia Labs., Albuquerque, N. Mex.
TARGET ASSESSMENT PERFORMANCE WITH 5 INCH AND 9 INCH TELEVISION MONITORS
L. M. Weston, B. H. Finley, and R. R. Prairie Jun. 1981 55 p refs
(Contract DE-AC04-76DP-00789)
(DE81-026754; SAND-81-1242) Avail: NTIS HC A04/MF A01

Target assessment performance with 5 in. and 9 in. television monitors are studied. The scenarios consisted of intrusion, nuisance, and false alarm scenarios under daytime and nighttime illumination levels. Performance differences between the 5 and 9 in. monitors are analyzed. DOE

N82-12318# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
CHARACTERISTICS OF A CODE DIVISION MULTIPLEX CONFIGURATION WITH DIRECT MODULATION
Heinz Huebner Feb. 1980 30 p refs In GERMAN; ENGLISH summary
(Rept-442-TBr-61) Avail: NTIS HC A03/MF A01

Nature and optimal usage of signal multiplexing by direct modulation code division is described. The advantage of resulting spreading of the spectra of individual narrow band input signals over the whole frequency bandwidth of the transmission channel is pointed out. The coding and decoding signal processing is explained and signal distortion and crosstalk are discussed. It is shown that distortion free transmission without crosstalk is possible provided the code carriers are orthogonal and the signals are converted into appropriate step-shaped intermediate signals. It is demonstrated that with nonorthogonal carriers only discrete input signals can be transmitted error free. Influences of nonideal transmission channels or components were not considered.
Author (ESA)

N82-12319# Philips Zentrallaboratorium G.m.b.H., Hamburg (West Germany). Forschungsabteilung Technische Systeme.
AUTOMATIC RECOGNITION OF COOPERATIVE SPEAKERS Final Report
Ruediger Frehse, Rudolf Geppert, Rainer Gierloff, Michael H. Kuhn, Hermann Ney, Herbert Piotrowski, and Horst Tomaschewski Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 168 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-80-009; ISSN-0170-9011) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33.30

Various statistical features were extracted in real time from speech samples from speakers and then processed for automatic identification and verification. On the basis of the most reliable feature, the long term averaged spectrum, two prototypes were set up: a minicomputer system with speaker reference on magnetic card for banking applications, and a microprocessor device for automatic entry control purposes. The error rates for false rejection and false acceptance are on the order of 2%. Author (ESA)

N82-12320# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
REDUCTION OF MULTIPATH FADING IN RADIO RELAY LINKS BASED ON THE PRINCIPLE OF OPTIMUM BEAM SCAN [VERRINGERUNG VON MEHRWEGESCHWUND IN GERICHTETEN FUNKVERBINDUNGEN NACH DEM PRINZIP DER OPTIMALEN STRAHLAUSRICHTUNG]
Karl-Peter Dombek Jan. 1981 38 p refs In GERMAN; ENGLISH summary
(Rept-455-TBr-71) Avail: NTIS HC A03/MF A01

A reflector antenna with limited electronic beam scan which allowed multipath fading to be reduced and requiring neither additional frequencies nor space for an extra antenna was constructed. Multipath fading and the diversity methods cur-

rently employed for its reduction are introduced. The antifading principle is described; in the case of interference, the antenna main beam is scanned in such a way that the angles of incidence of the direct and multipath signals are within the steep slope of the main beam. The required scanning range and the principle of signal processing are explained. Simulation of the field at the receiving antenna under fading conditions allows operation to be investigated experimentally. The results fully confirm theoretical predictions. Author (ESA)

N82-12321# Kiruna Geophysical Inst. (Sweden).
INCOHERENT SCATTER ION LINE FITTING PACKAGE
J. Murdin Jun. 1981 28 p refs
(KGI-TR-032) Avail: NTIS HC A03/MF A01

A program package for the analysis of incoherent scatter radar autocorrelation factor (ACF) measurements of ion lines is described. Input data is a suitably normalized ACF, noise corrected and corrected for the nonflat receiver frequency response (if necessary) and normalized by removal of the radar constants. Radar parameters and pulse are then delineated. Measured ACF is compared in the least squares sense to a theoretical ACF. Fit weights must be stated. The required plasma parameters that are to be adjusted in the least squares fit are selected and their initial values are chosen. The least squares fit is then implemented. Examples are worked through. Author (ESA)

N82-12322# Politecnico di Torino (Italy). Inst. di Elettronica e Telecommunicazioni.
SIMULATION OF A TELECOMMUNICATION DISTRESS SYSTEM Final Report
Ajmone M. Marsan, S. Benedetto, E. Biglieri, V. Castellani, L. L. Presti, and M. Pent Paris ESA Jul. 1980 160 p refs
(Contract ESTEC-3699/78)
(ESA-CR(P)-1449) Avail: NTIS HC A08/MF A01

A user oriented simulation package, TOPSIM (Torino politecnico simulator) designed for the study of communication systems is described. It allows the user to implement all the most typical system blocks through very simple and concise programming statements. It was used to analyze the distress system in the MARECS satellite. The simulation philosophy and the main building blocks of the package are outlined. A simplified approach to the theoretical analysis of the distress system is presented which shows the type of results expected. The usefulness of a simulation approach for a deeper insight into different parts of the system, is emphasized. A simulation example is given. Author (ESA)

N82-12323# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
PHONEMATIC RECOGNITION BY LINEAR PREDICTION: EXPERIMENT [RECONNAISSANCE PHONEMIQUE PAR PREDICTION LINEAIRE. L'EXPERIENCE DE L'ECOLE NATIONALE SUPERIEURE DES TELECOMMUNICATIONS (E.N.S.T.)]
Laurent Miclet, Yves Grenier, and Joel Leroux 1981 27 p refs In FRENCH; ENGLISH summary Presented at 12th Journees d'Etude sur la Parole, Montreal, May 1981
(ENST-C-81001) Avail: NTIS HC A03/MF A01

The recognition of speech signals analyzed by linear prediction is introduced. The principle of the channel adapted vocoder (CAV) is outlined. The learning of each channel model and adaptation to the speaker are discussed. A method stemming from the canonical analysis of correlations is given. This allows, starting with the CAV of one speaker, the calculation of that of another. The projection function is learned from a series of key words pronounced by both speakers. The reconstruction of phonemes can be explained by recognition factors arising from the vocoder. Automata associated with the channels are used for local smoothing and series of segments are treated in order to produce a phonemic lattice. Author (ESA)

N82-12324# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
PERFORMANCE EVALUATION OF THE VIRTUAL SUBCHANNEL CONCEPT FOR SATELLITE LINK COMMUNICATION
Guy Pujolle and Otto Spaniol (Frankfurt Univ.) Jul. 1981 31 p refs
(ENST-D-81002) Avail: NTIS HC A03/MF A01

The virtual subchannel concept which splits the satellite link into several components is analyzed and evaluated. These subchannels are assigned for transmission in cyclic order and are controlled independently of each other by the HDLC procedure. The efficiency evaluated in terms of error probability, system saturation, number of subchannels, frame length, etc., is lower than its theoretical maximum because of: (a) blocking of subchannels (due to an increased number of errors a subchannel becomes unable to accept new frames in its sender buffers), and (b) mutual blocking of subchannels; the flow control rule of the concept that any subchannel is blocked from accepting new frames if one channel is blocked by reason (a). Formulas for blocking probabilities are derived. The influence due to blocking can be neglected and efficiency tends to its theoretical maximum if a sufficient number of buffers are available. Author (ESA)

N82-12325# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.
THE 94GHz PROPAGATION FACILITY AT THE YPENBURG AIRFIELD AND THE FIRST EXPERIMENTAL RESULTS
W. P. M. N. Keizer Sep. 1979 34 p refs
(PHL-1979-34; TDCK-73420) Avail: NTIS HC A03/MF A01

Attenuation at 94 GHz caused by rain was investigated for vertical polarization on a 935 m link, with four rapid response rain gages and a distrometer. The measured and the theoretically predicted rain attenuation derived from the actually measured raindrop size distribution are compared. The decrease of antenna gain at 94 GHz due to water on a 1.2 m Cassegrain antenna is discussed. It is demonstrated that for accurate propagation measurements it is necessary to equip the antennas with protective shelters. Author (ESA)

N82-12326# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.
THE EFFECT OF PHASE ERRORS ON THE PERFORMANCE OF THE CAISSA ANTENNA
H. J. vanSchaik Oct. 1979 56 p
(PHL-1979-45; TDCK-73424) Avail: NTIS HC A04/MF A01

The effect of random and systematic phase errors on the performance of the CAISSA antenna, was investigated. To calculate the effect of phase deviation on performance, a random phase error distribution was adjusted to all antenna elements. It is indicated that degradation of antenna performance depends on the bounds of the phase error distribution and the position of the elements with the largest phase errors. As the total number of radiating elements increases, the influence of random phase errors decreases. Position of elements which fail is more important than quantity. It is shown that as the main lobe gets broader, gain decreases. Author (ESA)

N82-12327# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
DETECTION OF LASER RADIATION BY MEANS OF FORWARD SCATTERING IN THE ATMOSPHERE
J. A. Boden Nov. 1979 120 p refs
(PHL-1979-51; TDCK-73428) Avail: NTIS HC A06/MF A01

Scattering measurements of atmospheric aerosol size distributions for angles from 1 to 10 deg are reported. An optical tunnel was used to study forward and angular scattering. No correlation is found between variations of scatter signal and number of particles but angular scattering curves are similar to aerosol size distributions outside the laboratory. Detection distance was measured using source distance and detector field of view as parameters. For distant sources the detection limit is determined by the extinction coefficient and angular scattering function. Fraunhofer angular diffraction functions from the same aerosol size, but for different wavelenghts, are connected by the relevant Junge exponent. Author (ESA)

N82-12328# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.
ESTIMATION OF THE CUMULATIVE ATTENUATION DISTRIBUTION DUE TO RAIN ON A PATH EXCEEDING 1km, GIVEN THE CUMLATIVE DISTRIBUTION DUE TO RAIN ON A PATH OF 1km
J. H. Buijs Mar. 1980 25 p refs
(PHL-1980-13; TDCK-73842) Avail: NTIS HC A02/MF A01

Methods of forecasting the cumulative attenuation distribution at 94 GHz on various path lengths, using the value obtained for a 1 km path, are discussed. Where the probability of exceeding a specific attenuation is high, a path formed by a series of n paths, each of 1 km, is likely to suffer too. Where probability is low, the probability of a high attenuation value on a 1 km path, e.g., 15 dB, is assumed to be independent of the probability of the same attenuation on the following 1 km path in the series. The probability of exceeding a high attenuation value over the total path is determined by adding the values for that specific attenuation of all n 1 km paths. Differences for values around 15 dB are shown. Knowledge of the structure of rain showers should improve accuracy and investigation of a 5 km path is recommended. Author (ESA)

N82-12329# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 6: Signal Processing.
TRACKING PROCEDURES FOR FUCAS
A. M. Navarro Dec. 1980 44 p refs
(Contract A74/K/077)
(PHL-1980-45; TDCK-75027) Avail: NTIS HC A03/MF A01

Tracking procedures and the observation interval adaption algorithm of FUCAS, a phased array radar system, are described. The antenna pattern has an electronically steerable pencil beam. The antenna movements are not inertia limited. The FUCAS performs high quality tracking for more than one target, or combines search and track. Energy allocation is done seperately for several tasks, range accuracy of $>$ 3 m. The observation interval adaption algorithm keeps tracking errors constant. A change in acceleration interval is compensated by a change in the observation interval. Author (ESA)

N82-12330# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 6: Signal Processing.
EVALUATION OF THE PERFORMANCE OF A SIMPLIFIED MTI CANCELLER SELECTION RULE FOR FUCAS
G. W. M. vanMierlo Jul. 1981 46 p refs
(PHL-1981-24; TDCK-74960) Avail: NTIS HC A03/MF A01

A rule for the selection of a particular canceller from a set forming part of the FUCAS phased array radar system, is described. The rule takes clutter and noise suppression into account instead of signal to interference ratio (SIR) at the filter outputs. For a five-pulse canceller bank, performance loss when the wrong canceller is chosen is at most, 6 db, except where clutter center velocity is midway between the two canceller stopbands. Here loss may increase to 9 db. A bank of three-pulse cancellers shows maximum performance loss of 4 db, outside the region of target suppression in the stopbands. A strong correlation is shown between variation of the canceller transmission at the target velocity, and the variation in performance loss and probability of incorrect decision. Author (ESA)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-12331 Rutgers - The State Univ., New Brunswick, N. J.
HYDROGEN AND HYDROCARBON ABSORPTION AND DESORPTION IN SENSORS WITH TRANSITION METAL GATES ON MOS CAPACITORS Ph.D. Thesis
Tommy Leroy Poteat 1981 180 p
Avail: Univ. Microfilms Order No. 8122114

A change in the work function of transition metal oxides upon absorption or desorption of hydrogen and hydrocarbon gases was utilized to fabricate and characterize sensitive gaseous detectors. These sensors were made in the MNOS device structure with transition metal gates. The substrate semiconductor used in these experiments was silicon, dielectric layers were SiOs and Si3N4. Several types of transition metal gates were obtained by evaporation and sputtering of Pd, Pt and Ni, principal method of gaseous detection was the shift in the C-V curves upon absorption and desorption. A special tracking circuit was designed to measure the change in voltage at constant capacitance during hydrogenation. Dissert. Abstr.

N82-12332 California Univ., Los Angeles.
USE OF ON-CHIP REDUNDANCY FOR FAULT-TOLERANT VERY LARGE SCALE INTEGRATED CIRCUIT DESIGN Ph.D. Thesis
Tulin Erdim Mangir 1981 148 p
Avail: Univ. Microfilms Order No. 8121006

Use of redundancy to provide fault tolerance to manufacturing defects is studied through the use of a model for regularly designed chips. The sources of failures for MOS VLSI circuits are considered, improvement of yield with redundancy is modelled, and the techniques of bypassing defective areas on a logic chip which is designed regularly are reviewed. The emphasis is on identifying and classifying sources of failures during various stages of the lifetime of a VLSI chip, and on the development of a yield model for chips which are designed with extra (redundant) modules. Effects of various factors on yield improvement are studied. Here the emphasis has been on the effect of interconnection requirements. It is shown that, yield improvements of 100% or more over the nonredundant yields can be expected when redundancy is provided only for the logic areas. It is also observed that the improvement saturates above a certain amount (~10%) of redundancy. This indicates that the chips can be designed around an optimal amount of additional hardware on the chip to improve the yields. Dissert. Abstr.

N82-12333 Arizona Univ., Tucson.
MODULAR IMPLEMENTATION OF A DIGITAL HARDWARE DESIGN AUTOMATION SYSTEM Ph.D. Thesis
Manzer Masud 1981 182 p
Avail: Univ. Microfilms Order No. 8121928

An automation system based on AHPL (A Hardware Programming Language) was developed. The project may be divided into three distinct phases: (1) Upgrading of AHPL to make it more universally applicable; (2) Implementation of a compiler for the language; and (3) illustration of how the compiler may be used to support several phases of design activities. Several new features were added to AHPL. These include: application-dependent parameters, mutliple clocks, asynchronous results, functional registers and primitive functions. The new language, called Universal AHPL, has been defined rigorously. The compiler design is modular. The parsing is done by an automatic parser generated from the SLR(1)BNF grammar of the language. The compiler produces two data bases from the AHPL description of a circuit. The first one is a tabular representation of the circuit, and the second one is a detailed interconnection linked list. The two data bases provide a means to interface the compiler to application-dependent CAD systems. Dissert. Abstr.

N82-12334 State Univ. of New York at Stony Brook.
ON FINITE WORD LENGTH EFFECTS OF SECOND ORDER RECURSIVE DIGITAL FILTERS Ph.D. Thesis
Pei-Hwa Lo 1981 177 p
Avail: Univ. Microfilms Order No. 8120709

Factors which improve digital performance include filter structure, usage of different types of adders and calculation of scale factor. Based on the state space eigenvalue sensitivity function, a low sensitivity realization of a second order IIR filter was determined. The low sensitivity, modularity and mutual compatibility of the implemented output coefficients make this structure a good candidate for filter realization. A closed form upper bound of the filter state was found and used to determine the proper scale factor. For the uniform grid structure, it is shown that if the poles of the filter lie within a specific region, the proposed bound is better than the existing bounds. An algorithm for computing the signal to round off noise power ratio for all minimum realization configurations, is presented. Large magnitude, self-sustained, zero input limit cycle oscillations exist in a two's complement filter of canonical form. The locations of poles and the initial conditions of the filter affect the oscillation. A number of interesting properties concerning this phenomenon are investigated. Dissert. Abstr.

N82-12335 Cornell Univ., Ithaca, N. Y.
COMPUTER-AIDED SYNTHESIS AND DESIGN OF MONOLITHIC MICROWAVE INTEGRATED CIRCUITS (MMICS) Ph.D. Thesis
Louis Cho-Tai Liu 1981 199 p
Avail: Univ. Microfilms Order No. 8119462

A systematic computer aided synthesis technique of lumped lossy matching network, and a synthesis procedure of mixed lumped distributed matching network with arbitrary gain taper are presented. The exact synthesis procedure for lumped lossy matching networks presented can take arbitrary finite quality factor Q for each lumped element in the matching network. The gain bandwidth limitations of some useful lumped lossy matching networks are discussed and are summarized in a set of gain band width constraint plots. Design examples of both low noise and high power microwave broadband amplifiers using state of the art GaAs metalized semiconductor field effect transistor are presented to illustrate the synthesis and design procedure. The mixed lumped distributed matching networks are applicable monolitic microwave integrated circuits. Dissert. Abstr.

N82-12336 Colorado Univ. at Boulder.
A DESIGN PROCEDURE FOR TIME-VARYING DIGITAL FILTERS WITH HIGHLY QUANTIZED COEFFICIENTS Ph.D. Thesis
Frederick Lee Kitson 1981 165 p
Avail: Univ. Microfilms Order No. 8122298

Specific methods are given for both non-recursive and recursive structures. In both cases, the filter coefficients are periodic with period N and restricted to values of -1, 0 or + 1. Simple gain factors are also included in the recursive filters to ensure stability. It is shown that the filtering characteristics of these designs are nearly identical to those of time-invariant filters which employ 60 bit coefficient precision. The limitations of periodic time-varying finite impulse response filters with coefficients -1, 0 and + 1 were investigated. These filters were reformulated as N parallel time-invariant filters with commutating input switching. It was demonstrated that the time-varying filter design can sometimes lead to time-invariant structures having similar quantization. Dissert. Abstr.

N82-12337 Cornell Univ., Ithaca, N. Y.
NONUNIFORMLY DOPED GALLIUM ARSENIDE MICROWAVE POWER MESFETS Ph.D. Thesis
Seno Jadaprawira 1981 137 p
Avail: Univ. Microfilms Order No. 8119467

Nonuniform doping profile GaAS microwave power metallized semiconductor field effect transistors (MESFET) structures were investigated to explore the effects of various doping profiles on device charcteristics. Using molecular beam epitaxial materials, microwave power MESFETs with exponential, impulse, delta function as well as uniform doping profiles were fabricated. Device characteristics were examined at DC as well as at microwave frequencies. The nonuniformly doped MESFETs were found to have inferior field distribution which lead to smaller drain current capability. The drain-source burnout voltage was not affected, however, provided the full channel current was properly chosen. Burnout voltage of 45 volts was routinely obtained independent of the doping profile. graded doping profiles were found to be most effective in improving a MESFET's linearlity when the operating power level was well below the saturated power of the device. At large signal application, the advantage was significantly smaller. Hence the graded doping profile FETs are most useful for very linear operation but less so for the applications where larger power is more important than the linearity.
Dissert. Abstr.

N82-12338 Iowa State Univ. of Science and Technology, Ames.
APPLICATION OF KALMAN FILTERING IN COMPUTER RELAYING OF POWER SYSTEMS Ph.D. Thesis
Adly Ageeb Girgis 1981 214 p
Avail: Univ. Microfilms Order No. 8122515

Kalman filter models for the optimal estimation of the post-fault currents and voltages for computer relaying purposes of power systems are presented. As a prerequisite for the Kalman filtering implementation, the random description of the fault-induced noise signals was quantitatively studied. Empirical formulas that describe the random nature of the noise based on the probability of fault location and the frequency of occurrence of the difference types of faults are given. These empirical formulas offer the possibility of developing other techniques in computer relaying of power systems. Sensitivity of the Kalman filers to incorrect model parameters was studied through extensive simulation. A Kalman-filtering-based digital distance relay was designed to detect, classify, and locate faults in a high voltage transmission line in the shortest period of time. Comparison of the developed technique with four other algorithms demonstrated that the Kalman-filtering-based algorithm is superior to other techniques in the rate of convergence to the exact values, accuracy, and computer burden. Thus the Kalman filtering approach appears to be especially well-suited to the power system protection problem. Dissert. Abstr.

N82-12339 California Univ., Los Angeles.
SMALL-CHANNEL EFFECTS IN CHARGE-COUPLED DEVICES Ph.D. Thesis
John Yuantai Chen 1981 227 p
Avail: Univ. Microfilms Order No. 8120932

A two dimensional empty-well model is developed to calculate the potential barrier height for various interelectrode gap lengths in an overlapping CCD structure. The barrier height limits the charge handling capacity in short channel CCDs. A simple measurement technique is developed to obtain experimental data using submicrometer test devices, and the data are compared with the model. Several important process parameters relating to the barrier lowering are investigated for design consideration. Both short-channel and narrow-channel effects are investigated. Theoretical and experimental work are carried out to understand important CCD characteristics such as charge-handling capacity, charge transfer efficiency, and dark current in reduced geometry devices. Dissert. Abstr.

N82-12340 Illinois Univ. at Chicago Circle, Chicago.
THE STABILITY AND SOLDERING VOID EFFECT OF LARGE SUPERCONDUCTOR Ph.D. Thesis
Yuchi Huang 1981 235 p
Avail: Univ. Microfilms Order No. 8120567

A test facility was designed and set up for the investigation of superconductor performance and superconducting magnet safety under both steady-state and transient conditions. The conductor for the superconducting magnetohydrodynamic dipole magnet for the Coal-Fired-Flow-Facility at the University of Tennessee Space Institute was tested. The result showed that the superconductor performance test facility was properly set up and highly serviceable. The effect of the soft soldering void between the superconducting cable and the copper stabilizer of the MHD superconductor was investigated experimentally and theoretically. In the theoretical simulation mode, an equation for critical void length was analytically obtained. The electrical equation and heat balance equations were also solved by using the backward difference method. Both experimental test results and numerical analysis results showed that the recovery characteristics were strongly dependent on the void length.
Dissert. Abstr.

N82-12341 Rensselaer Polytechnic Inst., Troy, N. Y.
IMPLEMENTATION OF SAW CHIRP TRANSFORM AND SAW CONVOLVERS IN SPREAD SPECTRUM COMMUNICATION SYSTEMS Ph.D. Thesis
Dan Abraham Shklarsky 1981 161 p
Avail: Univ. Microfilms Order No. 8121163

Surface Acoustic Waves (SAW) signal processing devices are attractive for use in wide-band communication systems, specifically in large TB spread spectrum systems. Three ideas in which SAW elements are implemented to improve the performance of spread spectrum communication system are discussed: an adaptive narrow-band interference suppressor, the introduction the Hilbert transformed carrier sequence to double that data rate of a given spread spectrum system, and a time integrating correlation (TIC) which is insensitive to Doppler shifts of the carrier frequency. In the narrowband suppressor, real time SAW chirp Fourier transformers are the main elements of the system in which the Fourier domain signals are going through an adaptive notch filtering process which identifies, locates and suppresses possible narrow-band interference sources. The result is a system which can increase the effective compression gain of a given

spread spectrum system whenever narrow-band interference sources exist. Dissert. Abstr.

N82-12342 Rensselaer Polytechnic Inst., Troy, N. Y.
THE EFFECT OF OPTICALLY ENHANCED LEAKAGE CURRENT ON S-BAND TRAPATT DIODE OSCILLATORS Ph.D. Thesis
April Marie Schweighart 1981 239 p
Avail: Univ. Microfilms Order No. 8121162

The effects on output power and frequency of oscillation are presented and compared with a theoretical, closed form model. In general, the power decreases gradually and the frequency increases rapidly with photocurrent at low levels, while the power decreases rapidly while teh frequency levels off a higher levels of photocurrent. These results, however, are found to be very dependent on the tuning of the TRAPATT device. The design and fabrication of unique top ring contact N(+)PP(+) silicon devices was made to permit optical excitation. The devices were mounted junction side up with the top metal contact having an optical window to allow the light to shine directly on the silicon surface, and thus generate photocurrent. The two-dimensonal effects inherent in this structure were found to be negligible from passive RF tests. Dissert. Abstr.

N82-12343 Houston Univ., Tex5.
ELECTROSTATIC LENSES OF THE ANTISYMMETRIC QUADRUPOLE AND SYMMETRIC OCTUPOLE QUADRUPLET Ph.D. Thesis
Leon Fa-Lian Chang 1981 170 p
Avail: Univ. Microfilms Order No. 8120903

Electrostatic quadrupole octupole lens systems are studied to focus a cone of electron beams emanating from a point source. The half angle of emission is 0.01 radian and the accelerating voltage is 10 KV. These are desirable parameters for e beam lithography. An antisymmetric quadruplet simulates a round lens which gives a regular image with the capability of aberration correction. The analytical solution for trajectories is obtained by assuming an ideal hyperbolic field and by neglecting the second-order effects such as the fringe-field, local voltage, and relativistic effect. An initial guess of the sign parameters is provided. For the real case design, a successive over relaxation technique is used to solve Laplace's equation for potential distribution in three dimensional cylindrical coordinates. The boundary values are imposed around the primary region which is the first 45 deg for a quadrupole and the first 22.5 deg for an octupole. Dissert. Abstr.

N82-12344*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
S-BAND SHALLOW BULK ACOUSTIC WAVE (SBAW) MICROWAVE SOURCE Final Report
Jul. 1981 44 p refs
(Contract NAS5-26002)
(NASA-CR-166744) Avail: NTIS HC A03/MF A01 CSCL 09C

Techniques necessary to fabricate a high performance S-band microwave single source using state-of-the-art shallow bulk acoustic wave (SBAW) were explored. The bulk wave structures of the AIN/Al 2O3 were investigated for both the R plane and basal plane of sapphire. A 1.072 GHz SBAW delay line and oscillators were developed. A method of selecting and setting oscillator output frequency by selecting substrate orientation angle was also established. B.W.

N82-12345*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTIPLE-BEAM, HIGH-POWER, PRECISION POINTING ANTENNA SYSTEM Patent Application
Kenneth E. Woo (JPL, California Inst. of Tech., Pasadena) and Paul W. Cramer, Jr., inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 30 Oct. 1981 16 p
(Contract NAS7-100)
(NASA-Case-NPO-15406-1; US-Patent-Appl-SN-315585) Avail: NTIS HC A02/MF A01 CSCL 09C

An antenna with a plurality of beams that can be electronically steered simultaneously in unison is described. The beams may be steered independently. A relatively small phased array of antenna elements feeding a near field dual reflector system is used to magnify the aperture of the feed array to that of the main reflector thereby providing high gain. The main reflector and the subreflector are shaped reflectors which may be confocal paraboloids having nominally the some focal length to diameter ratio, although the subreflector may be oversized. The array feed is placed so that the subreflector is in the near field of feed. S.L.

N82-12346*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PHASE SENSITIVE GUIDANCE SENSOR FOR WIRE-FOLLOWING VEHICLES Patent Application
George R. Hansen (JPL, California Inst. of Technology, Pasadena) Filed 30 Oct. 1981 15 p
(Contract NAS7-100)
(NASA-Case-NPO-15341-1; US-Patent-Appl-SN-315583) Avail: NTIS HC A02/MF A01 CSCL 09C

A guidance sensor for a wire-following vehicle which is phase sensitive is described. The sensor includes an array of coils positioned to sense the vertical component of a magnetic field produced by the AC current through the guidance wire. The outputs of the coils are fed to associated flip flops. Flip flops associated with coils, through which flux passes in one direction, e.g., up, are driven to one state, e.g., true, and flip flops associated with coils through which flux passes in the opposite direction, e.g., down, are driven to a false state. The control signal to guide the vehicle to be over the wire is a function of the number of flip flops in the true state. Circuitry is included to prevent flip flops from assuming a wrong state due to noise. NASA

N82-12347*# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER DC-TO-DC CONVERTERS
Thomas G. Wilson, Harry A. Owen, Jr., and Paul M. Wilson 1981 11 p refs Presented at the U.S-Japan Sci. Seminar on Analysis and Design in Power Electron., Kobe, Japan, 25-28 Nov. 1981
(Grant NsG-3157)
Avail: NTIS HC A02/MF A01 CSCL 09C

The current and voltage waveshapes associated with the power transitor and the power diode in an example current-or-voltage step-up (buck-boost) converter were analyzed to highlight the problems and possible tradeoffs involved in the design of high voltage high power converters operating at switching frequencies in the range of 100 Khz. Although the fast switching speeds of currently available power diodes and transistors permit converter operation at high switching frequencies, the resulting time rates of changes of current coupled with parasitic inductances in series with the semiconductor switches, produce large repetitive voltage transients across the semiconductor switches, potentially far in excess of the device voltage ratings. The need is established for semiconductor switch protection circuitry to control the peak voltages appearing across the semiconductor swtiches, as well as to provide the waveshaping action require for a given semiconductor device. The possible tradeoffs, as well as the factors affecting the tradeoffs that must be considered in order to maximize the efficiency of the converters are enumerated. A.R.H.

N82-12348# Technische Universitaet, Brunswick (West Germany).
X-RAY EMISSION OF HIGH VOLTAGE VACUUM DEVICES Ph.D. Thesis
D. Dohnal 1981 175 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC A08/MF A01

The X-ray emission of vacuum arrangements, especially of vacuum circuit breakers, is reported at voltages up to 140 kV. The theoretical relationship between X-ray generation and the measurement of dose quantities is discussed. Various processes of electrode conditioning were analyzed. In the predischarge phase at d.c. voltage the relationship between X-rays and electrical values was studied, considering the influence of a large number of parameters, such as electrode material, electrode curvature and surface roughness. The effects at a.c. voltage are specified and compared with the results obtained at d.c. voltage. The experimental results offer a large range of applications for X-rays

as a means of diagnosis. Some of these possibilities are discussed. T.M.

N82-12349*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A SIMPLIFIED POWER FACTOR CONTROLLER WITH INCREASED ENERGY SAVING CIRCUIT Patent Application
Frank J. Nola, inventor (to NASA) Filed 28 Aug. 1981 12 p
(NASA-Case-MFS-25323-1; US-Patent-Appl-SN-297524) Avail: NTIS HC A02/MF A01 CSCL 09A

A device which controls the power input to an induction motor by controlling the power of the motor is disclosed. Two features of the device increase its sensitivity under conditions where the motor is unloaded in order that full control operation is possible with the device adjusted to operate with the power input just sufficient to sustain motor operation. A feedback circuit comprising of a resistor, which feeds back to a summing junction from a signal point at which a triac control signal appears. The requirement that motor current be directly sampled in the process of determining the power factor of the power input to a motor is eliminated. S.L.

N82-12350# Federal Aviation Administration, Atlantic City, N.J.
EVALUATION OF CATHODE-RAY TUBE PROTECTION FOR THE ELECTRONIC TABULAR DISPLAY SUBSYSTEM (ETABS) ENGINEERING MODEL Final Report, Jan. 1980 - Jan. 1981
Anthony R. Wilson Sep. 1981 17 p refs
(AD-A105199; FAA-CT-81-66; FAA-RD-81-26) Avail: NTIS HC A02/MF A01 CSCL 09/1

This report describes the safety evaluation of the 25-inch (diagonal) rectangular cathode-ray tube (CRT) that is used in the engineering model of the Electronic Tabular Display Subsystem (ETABS). An evaluation of ETABS will be performed at the Federal Aviation Administration (FAA) Technical Center for possible application in FAA Air Route Traffic Control Centers (ARTCC). The safety evaluation included standard industry pressure testing and special implosion testing on 12 CRT samples. Eleven of the twelve CRT samples satisfactorily met the safety requirements for both the pressure and implosion testing. One CRT cracked when subjected to 45 pounds per square inch (psi) of air pressure; however, the CRT did not implode. The 25-inch rectangular CRT will therefore provide a high degree of safety for use in each of the two tabular displays of the ETABS engineering model. Author (GRA)

N82-12351# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
A SYSTOLIC 2-D CONVOLUTION CHIP Interim Report
H. T. Kung and S. W. Song Mar. 1981 13 p refs
(Contract N00014-76-C-0370; N00014-80-C-0236; F33615-78-C-1551; Grant NSF MCS-78-23676)
(AD-A104872; CMU-CS-81-110) Avail: NTIS HC A02/MF A01 CSCL 09/5

This paper describes a chip for performing the 2-D (two-dimensional) convolution in signal and image processing. The chip, based on a systolic design, consists of essentially only one type of simple cells, which are mesh-interconnected in a regular and modular way, and achieves high performance through extensive concurrent and pipelined use of these cells. Denoting by u the cycle time of the basic cell, the chip allows convolving a kxk window with an nxn image in O(sq m)(u/k) time, using a total of cu k basic cells. The total number of cells is optimal in the sense that the usual sequential algorithm takes O(sq m)(sq k) (u) time. Furthermore, because of the modularity of the design, the number of cells used by the chip can be easily adjusted to achieve any desirable balance between I/O and computation speeds. Author (GRA)

N82-12352# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
SILICON-ON-SAPPHIRE MEDIUM POWER MESFET Interim Report
Feb. 1981 10 p
(Contract N00014-80-C-0862)
(AD-A105378) Avail: NTIS HC A02/MF A01 CSCL 09/1

The key aspect in improving the performance of SOS MESFETs is to reduce the parasitic source resistance. While the extrinsic g sub m of GaAs MESFETs is now close to that of the intrinsic device (i.e., with R sub S = R sub D = 0), SOS MESFETs still have significant progress to be made in the area of source resistance reduction. The source resistance can be most effectively reduced by spacing the gate closer to the n(+) source implant. The smallest spacing is then determined by the gate-to-source breakdown voltage. GRA

N82-12353# Naval Research Lab., Washington, D. C.
ANALYSIS OF COAXIAL EMI FEEDTHROUGH FILTERS CONTAINING FERRITE ELEMENTS Interim Report
G. H. Stauss, J. J. Krebs, and W. G. Maisch 16 Oct. 1981 33 p
(XF43453401)
(AD-A105248; NRL-MR-4651) Avail: NTIS HC A03/MF A01 CSCL 09/5

An analysis of coaxial EMI (Electromagnetic Interference) feedthrough filters containing high permeability ferrite and high permittivity dielectric elements is given. The frequency dependent complex permeability and permittivity of useful materials are modeled, and the effect of these parameters as well as load and source impedance, filter dimensions and number of filter elements on the insertion loss behavior are investigated. Filter problems are treated as are suggestions for improved performance. GRA

N82-12354# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
FEASIBILITY STUDY OF DEVICE SYNTHESIS OF NON-LINEAR FILTERS Final Report, 1 Mar. 1976 - 31 May 1981
R. S. Bucy and W. H. Steier May 1981 19 p refs
(Contract F44620-76-C-0085; AF Proj. 2305)
(AD-A105417; AFOSR-81-0665TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

Efforts to date have shown that with careful tailoring to the problem at hand and by taking maximum advantage of recent advances in parallel/pipeline array processor architecture, the nonlinear filter is a practical estimation technique. The computational effort is signifcantly greater than for conventional linear or linearized (e.g., extended Kalman filtering) techniques, but the performance advantage may be significant where the observation is a significantly nonlinear function of the estimated states, and/or where the observation noise (or plant noise) is significantly non-Gaussian. The research has concentrated on the phase estimation problem which has proven to be an ideal test problem. However, with the techniques that have now been developed and proven, it is appropriate to consider a larger class of problems. Potential applications should meet the following criteria: (1) Performance advantages are of significant economic value, (2) Observations are essentially nonlinear functions of the states that have to be estimated where the linear filter leads to unacceptable performance, (3) Measurement (or state) noise is highly non-Gaussian. Excellent example meeting all the above criteria would be the ELF communications problem. Other examples occur in deep space communication and in detection and tracking problems in general. Author (GRA)

N82-12355# Advanced Research and Applications Corp., Sunnyvale, Calif.
SILICON QUALITY: A CONSIDERATION FOR VHSI CIRCUIT DEVELOPMENT Final Report, 15 Dec. 1979 - 15 Sep. 1981
T. J. Magee, C. Leung, R. Ormond, and L. J. Palkuti 28 Sep. 1981 89 p refs
(Contract N00014-80-C-0071)
(AD-A105198; ARACOR-FR-81-53) Avail: NTIS HC A05/MF A01 CSCL 13/8

A detailed evaluation of the quality of silicon wafers from representative domestic and foreign vendors was made. To avoid pre-selection of wafers by vendors, material was obtained directly from device manufacturers and therefore represents a statistical sampling of Si material as currently being used in production-line processing. The results of this study have shown extreme batch-to-batch variability, lack of control in material quality and, in many cases, unacceptable levels of defects in silicon wafers used in manufacturing. The development of front-and-back-surface

laser-gettering procedures for improving quality is reported and newly developed techniques for stabilizing back-surface damage, using the enhanced diffusion of oxygen, are discussed.
Author (GRA)

N82-12356# Eaton Corp., Melville, N.Y.
MICROWAVE TRANSVERSAL EQUALIZER. OPEN LOOP ADAPTIVE COMPUTER CONTROL TECHNIQUES Final Technical Report, 7 Jan. 1980 - 27 Feb. 1981
A. Leber, G. Kanischak, D. Wang, M. Daigle, and R. Indin Griffiss AFB, New York RADC Jul. 1981 90 p
(Contract F30602-80-C-0042; AF Proj. 4506)
(AD-A105005; RADC-TR-81-197) Avail: NTIS HC A05/MF A01 CSCL 09/5

Adaptive equalization techniques, as well as suitable algorithms and computer programming procedures, have been developed to provide open loop control of the Microwave Transversal Equalizer. The resultant computer analysis will determine the necessary MTE control adjustments to minimize time sidelobe distortion. Author (GRA)

N82-12357# Fulmer Research Inst. Ltd., Stoke Poges (England).
FIELD EMISSION COLD CATHODE DEVICES BASED ON EUTECTIC SYSTEMS Final Technical Report, 1 May 1977 - 31 Dec. 1979
Duncan Stewart, Vivian G. Rivlin, and Paul D. Wilson Jul. 1981 117 p refs
(AD-A104795; RADC-TR-81-170) Avail: NTIS HC A06/MF A01 CSCL 09/1

A survey has been made of the performance as field emission cold cathodes of selected refractory materials fabricated as needle arrays by unidirectional solidification. Cathodes based upon refractory metal carbides have been fabricated and tested. Performance data has been obtained using niobium, tantalum and vanadium carbides with various cathode geometries. Life times of over 1,000 hours and current densities of up to 1 A/sq. cm. have been obtained. Preliminary experiments indicated tha LaB6 can be formed into platelets by conventional cooling in an aluminum matrix and that directional solidification should produce suitable rod-like morphology. Author (GRA)

N82-12358# Hughes Research Labs., Malibu, Calif.
LOW-LOSS FIBER WAVEGUIDES Annual Technical Report, 1 Aug. 1980 - 30 Jun. 1981
J. A. Harrington Sep. 1981 56 p refs
(Contract N00014-79-C-0691)
(AD-A104943) Avail: NTIS HC A04/MF A01 CSCL 09/1

This annual report summarizes our second year of effort to fabricate low-loss fiber waveguides with potential loss near 10 to the minus 3 dB/km. To develop such low-loss waveguides, we have used alkali and thallium halides to form poly- and single-crystal fibers. To date our best polycrystalline KRS-5 (T1BrI) fiber remains 5 orders of magnitude above the goal of 10 to the minus 3 dB/km. Author (GRA)

N82-12359# Rockwell International Corp., Thousand Oaks, Calif. Electronics Research Center.
PIEZOELECTRIC ZnS FILM ON SILICON Final Report, 1 Nov. 1979 - 31 Oct. 1980
Edward J. Staples Jun. 1981 26 p refs
(Contract F49620-79-C-0022; AF Proj. 2306)
(AD-A105161; ERC41018.3FR; AFOSR-81-0682TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

The objective of the present research investigation is to theoretically analyze the electromechanical coupling of piezoelectric zinc sulfide films on silicon substrates. During the past twelve months, considerable efforts have been made in analyzing the experimental results which were obtained in FY 1979. In order to accomplish this, a computer program was written to calculate surface-acoustic-wave electromechanical coupling constants for layered media. The calculation included four configurations of the excitation of surface acoustic waves in different orientations of silicon using cubic and hexagonal ZnS films. The calculated results showed that the best acoustic coupling for ZnS films is 0.0001 which is an order of magnitude smaller than ZnO films on silicon. Also included in this report is the calculation of ZnO films on fused quartz and various orientation of silicon.
Author (GRA)

N82-12360# Rockwell International Corp., Thousand Oaks, Calif.
ION IMPLANTED GaAs I. C. PROCESS TECHNOLOGY Final Technical Report, 1 May 1977 - 30 Jun. 1980
R. Zucca, S. I. Long, B. M. Welch, F. S. Lee, P. Asbeck, C. G. Kirkpatrick, C. P. Lee, Y. D. Shen, R. C. Eden, and F. H. Eisen Jul. 1981 275 p refs
(Contract F49620-77-C-0087; ARPA Order 3384)
(AD-A104946; ERC41005.25FR; AFOSR-81-0693TR) Avail: NTIS HC A12/MF A01 CSCL 09/5

This report covers a program on the development of a planar GaAs digital integrated circuit (IC) technology. The main goals of this program were the development and implementation of the fabrication technology, and the demonstration of the feasibility of reaching large-scale integration (LSI) with high-speed, low-power GaAs digital ICs. In approximately 3 1/2 years a planar fabrication process was developed and refined. The program started with the fabrication of the first planar FET transistors using the new process, and the demonstration of Schottky diode-FET logic (SDFL) gates, showing high speed operation of ring oscillators. After this initial stage, many logic circuits have been built. The complexity of these demonstration circuits, involving both combinatorial and sequential logic, grew at a nearly exponential rate. Among the most complex circuits fully demonstrated is a 5 x 5 bit parallel multiplier employing 260 SDFL gates. GRA

N82-12361# TriTec, Inc., Columbia, Md.
ADVANCED ELECTROFLUIDIC SERVOVALVE DEVELOPMENT Final Report, Apr. 1980 - Apr. 1981
Lester K. Pecan Fort Eustis, Va. Applied Technology Lab. Aug. 1981 47 p
(Contract DAAK51-80-C-0017; DA Proj. 1L1-62120-AH-25)
(AD-A105172; USAAVRADCOM-TR-81-D-30) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report covers the advanced development of an electro fluidic servovalve. This device accepts and sums electrical and hydraulic inputs and provides an output capable of accurately positioning a hydraulic actuator. The design employs fluidic amplifiers with rotating movable flow splitters, an actuator piston feedback mechanism, and a unique positive derivative feedback circuit. The need for adequate actuator flow is met by use of a spool valve to augment the driving amplifier output. The positive derivative feedback circuit controls spool response, so that flow to the actuator is proportional to actuator velocity. Demonstration tests of the final design showed satisfactory performance of the rotary splitter concept, and an order-of-magnitude increase in servovalve frequency response through use of derivative feedback. Author (GRA)

N82-12362# Stanford Linear Accelerator Center, Calif.
STUDY OF THE EMISSION PERFORMANCE OF HIGH-POWER KLYSTRONS: SLAC XK-5
Yong-xiang Zhao Jul. 1981 51 p refs
(Contract DE-AC04-76SF-00515)
(DE81-030177; SLAC-TN-81-5) Avail: NTIS HC A04/MF A01

There are hundreds of high power klystrons operated in the Linac gallery and about fifty to sixty tubes fail every year. The lifetime ranges from a few thousand up to seventy thousand hours except those which fail during an early period. The overall percentage of failures due to emission problems is approximately 25 percent. It is also noted that a 10 percent increase in mean lifetime of klystrons will reduce the overall cost per hour as much as a 10 percent increase in efficiency. Therefore, it is useful to find some method to predict the expected life of an individual tube. The final goal has not been attained yet, but some useful information was obtained. It is thought that this information might be helpful for those people who will study this subject further. DOE

N82-12363# Ames Lab., Iowa.
SUPERCONDUCTIVITY IN Th-Nb COMPOSITES Ph.D. Thesis
Loren Frederick Goodrich 1980 144 p refs
(Contract W-7405-eng-82)
(DE81-030746; IS-T-926) Avail: NTIS HC A07/MF A01

Heat capacities, critical temperatures and critical currents have been measured for directionally solidified eutectic Th-Nb

wires in order to determine whether superconductor-normal metal boundary is a strong pinning center for quantized vortices. The het capacity data show that there is a large change in pair potential at the super-normal boundaries as predicted by de Gennes boundary conditions. The T/sub c/ data were used to evaluate the extrapolation length b, and to show that Ginsburg-Landau predicts the changes in the superconductors rather well. Hence, the equilibrium thermodynamical properties are predicted from the filament size and spacing rather well. DOE

N82-12364# Sandia Labs., Albuquerque, N. Mex.
UPGRADING THE INTENSE NEUTRON SOURCE HIGH VOLTAGE POWER SUPPLY
A. A. Riedel Jul. 1981 12 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028970; SAND-81-1665) Avail: NTIS HC A02/MF A01

The intense neutron source high voltage power supply displayed breakdown problems from the start of the project. The problems are analyzed and solutions provided for upgrading the supply. Recent modifications have virtually eliminated power supply internal breakdowns. The report also specifies preacceptance tests for a supply to assure reliable operation under an arcing load. DOE

N82-12365# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).
DEVELOPMENT OF MICROPROCESSOR COMPATIBLE SENSORS Final Report
Herbert Reichl, Ernst Obermeier, Eberhard Rose, Ho-Jung Hwang, Caszlo Csepregi, and Klaus Dieter Muehlbauer Bonn Bundesminisierium fuer Forschung und Technologie Dec. 1980 248 p refs In GERMAN; ENGLISH summary Sponsored by Bundesminisierium fuer Forschung und Technologie
(BMFT-FB-T-80-197; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 45,70

A frequency analog monolithic pressure sensor was developed. The doping and temperature dependence of the piezo-coefficients were measured and the arrangement of the resistors on the diaphragm was optimized. Based on the use of I(2)L ring oscillators in frequency analog sensors, a two-wire measurement system was developed for multisensor applications. For noncontact temperature measurements, a thin film bolometer with a risetime of 6 msec was fabricated. An ion implanted Al203 humidity sensor with linear output characteristics was also developed. Low cost microprocessor controlled analog to digital conversion methods were investigated together with the linearization and approximation of sensor output characteristics. Author (ESA)

N82-12366# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).
INVESTIGATION OF ELECTROCHROMIC EFFECTS FOR DISPLAY APPLICATION Final Report
Guenter Baur, Lutz Pickelmann, Ortwin Schirmer, Peter Schlotter, Volker Wittwer, Heidrun Biebl, Heinz Strinitz, and Christa Vogel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-196; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,70

The physical and physicochemical properties of tungsten oxide layers which are important for display applications are elucidated: the electrochromic switching behavior, particularly the ion transport mechanism, and the stability and aging effects. A solution of these problems implies a systematic analysis of the structure of the thermally evaporated tungsten oxide layers used for electrochromic displays. By variation of the evaporation conditions and by studying the film structure it was possible to find out the structure of thermally evaporated layers as well as the principles of the ion transport mechanism. Author (ESA)

N82-12367# Vacuumschmelze G.m.b.H., Hanau (West Germany). Entwicklungsabt.
HIGH FIELD SUPERCONDUCTORS OF NbTi WITH CURRENT CAPACITIES IN EXCESS OF 3000A FOR APPLICATION IN MAGNET SYSTEMS WITH ALTERNATING FIELD COMPONENTS Final Report
Karl Juergen Best, Hans Hillmann, Hans Hoeflich, Johann Rudolph, Irmtraud Pfeiffer, and Hartwin Weber Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 207 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-009; ISSN-0340-7608) Avail: NTIS HC A10/MF A01

Monolithic and fully transposed NbTi base conductors in the form of flat cables, with current capacities of up to 10,000 A at 5 T and 4.2 K were developed for use in magnet systems. Methods for measuring the critical values of optimized conductors are described. For conductor manufacturing, extrusion as well as bundling and sealing methods were developed and tested. A number of conductors with different substrate amounts and combinations with high resistivity Cu Ni substrate were produced and electrically optimized. Fully transposed conductors were developed as flat cables. A process for continuous soldering and a soldering cable were developed and set up in order to meet higher mechanical requirements. Author (ESA)

N82-12368# Siemens A.G., Munich (West Germany). Research Labs.
BLUE LIGHT EMITTING LUMINESCENT DIODES OF SILICON CARBIDE Final Report
Guenther Ziegler Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-010; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,65

A substantially improved procedure for the fabrication of SiC-LED's (maximum wavelength 475 nm) by liquid phase epitaxy on 6 H silicon carbide substrates is described. The quantum efficiency of encapsulated diodes is increased to 1.2 x 10E-4. The reproducibility of fabrication is improved by refined substrate control and preparation techniques. The epitaxial process is simplified, the surface of the layers is improved and doping concentrations are optimized. Reliable bonding of contacts is achieved. Diced chips show a decrease in quantum efficiency and a green shift of the emission spectrum, even under low current density conditions. This effect is avoided by mesa etching and an improved mounting technique. Author (ESA)

N82-12369# Siemens A.G., Munich (West Germany). Research Lab.
ELECTRICAL MACHINES WITH SUPERCONDUCTING WINDINGS. PART 3: HOMOPOLAR dc MACHINES Final Report
Dieter Kullman and Peter Henninger Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 163 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-015-Pt-3; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,60

The losses in rotating liquid metal contacts and the problems in including liquid metals were theoretically and experimentally studied. These machines are shown realiable. For electric ship propulsion, they are a more efficient method of power transmission than mechanical gearboxes. However, weight reduction as compared to mechanical gearboxes can hardly be achieved with machines fully shielded by magnetic iron. Author (ESA)

N82-12370# National Gas Turbine Establishment, West Drayton (England). Naval Electric Engineering Dept.
VOLTAGE TEST FACILITY FOR DEFENCE STANDARD 61-5
D. Pickering 1980 100 p
(Contract R-D-Item-7809/4776/1)
(NGTE-M-80112(L); BR77257) Avail: NTIS HC A05/MF A01

The design of a microprocessor controlled waveform synthesizer to effect the automatic generation of a defined 440 volt 60 Hz supply for tests of compliance with Defense Standard 61-5 is described. It is able to produce both LIMIT 1 and 2 voltage envelopes when in control of the 1 MW generator.

Operation is simple and because of features built into the controlling software, a high degree of safety in operation is achieved. Accurately repeatable over/under voltage testing of electrical equipment is possible. Author (ESA)

N82-12371# Filtronic Components Ltd., Leeds (England).
EXTRACTED-POLE FILTER MULTIPLEXION AND ASYMETRIC DOUBLE ARRAY NETWORK SYNTHESIS
J. D. Rhodes Paris ESA 1980 32 p refs
(Contract ESTEC-4289/80/NL-DG)
(ESA-CR(P)-1453) Avail: NTIS HC A03/MF A01

Using an analytical technique, the modifications necessary to a TEO11 mode extracted pole device are estimated. If in the physical device there is tuning on the irises and for the resonant frequencies of the cavities, then the individual doubly terminated filter may be tuned to operate as any channel in a manifold multiplexer. The synthesis procedure is analytic apart from the numerical factorization of the numerator of the reflection coefficient. The procedure accurately determines the maximum gain constant consistent with obtaining a bounded real transfer function. Author (ESA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-12372 Rensselaer Polytechnic Inst., Troy, N. Y.
RADIATIVE HEAT TRANSFER IN EMITTING, ABSORBING AND ANISOTROPICALLY SCATTERING PARTICULATE CLOUDS Ph.D. Thesis
Farzin Homayoun Azad 1981 193 p
Avail: Univ. Microfilms Order No. 8121136

Radiative heat transfer in emitting, absorbing and anisotropically scattering media. The validity of the well established differential approximation to the case of anisotropic scattering is extended. Furthermore, the influence of highly anisotropic Mie scattering is investigated. Exact solutions for temperature distribution and radiative flux are found for scattering phase functions with up to 35 terms in their Legendre polynomial series expansion and are used as basis for comparison of linear anisotropic and differential approximation models. In dealing with anisotropic scattering in cylindrical media, and exact solution is developed, resulting in a first order integral equation. Also, two approximate methods are developed and tested for their accuracy. Dissert. Abstr.

N82-12373 Arizona Univ., Tucson.
HEAT TRANSFER IN A FIXED BED AND MASS TRANSFER IN A COUNTER-CURRENT MOVING BED Ph.D. Thesis
Filho Osmario Dellaretti 1981 138 p
Avail: Univ. Microfilms Order No. 8120721

The behavior of gas-solid reactors known as compact-fixed and moving beds, is analyzed from a theoretical viewpoint. For a compact fixed-bed the solution of the energy balance equations is obtained for the cases of a uniform temperature inside the solid pellets (i.e., the Biot number is zero) and for the case in which there are temperature gradients within the pellets (Bi > 0). For short contact times, beds with Bi > 0 have gas- and solid- temperatures which are greater than the temperatures within beds with Bi = 0. For long times, the situation is reversed. For a compact-moving bed the solution of the mass balance equations is obtained for the cases of a feed-solid with an oscillating concentration. For both types of beds there is an equivalence between mass transfer and energy transfer so that the solutions can be interchanged with suitable definitions of dimensionless variables. Dissert. Abstr.

N82-12374 Lehigh Univ., Bethlehem, Pa.
SELF-SUSTAINED OSCILLATIONS OF A MIXING LAYER. EDGE SYSTEM Ph.D. Thesis
Samir Refaat Ziada 1981 242 p
Avail: Univ. Microfilms Order No. 8118853

Velocity measurements using hot film anemometry, flow visualization using hydrogen bubble and dye injection techniques, and simultaneous recording of the force exerted on the wedge were employed to explore the globally organized nature of the mixing layer-wedge interaction. Velocity perturbations at the separation location are intimately related to the force exerted on the wedge and grow exponentially downstream with growth rates in close agreement with the linear stability theory. Higher harmonics of the fundamental mode are generated near the critical layer of the mixing layer while the disturbance amplitude is still small. Vortex-wedge interaction mechanisms and the amplitude of the force exerted on the wedge are a strong function of he transverse offset between the leading edge of the wedge and the center of the incident vortex. A special case of 'resonance' was also investigated, in which the subharmonic mode is coupled with a free surface wave phenomenon, resulting in a process of consistant vortex pairing upstream of the impingement wedge. Dissert. Abstr.

N82-12375 State Univ. of New York at Buffalo.
GENERALIZED STUDY OF A HYDRAULICALLY ACTUATED MECHANISM SYSTEM Ph.D. Thesis
Viswanathan Venkatraman 1981 390 p
Avail: Univ. Microfilms Order No. 8122207

A composite system consisting of the mechanism and the actuator is considered with emphasis on the interaction between the two important subsystems. A mathematical model based on the lumped parameter system is formulated and a set of dimensionless nonlinear state equations representing the dynamics of the composite system is derived. All the significant system parameters, namely, mechanical inertia, load, Coulomb friction, viscous damping, fluid capacitance, fluid inertia, leakage and fluid resistance are accounted for in the model. System analysis techniques in the time domain are applied and the behavior of the system is studied. It is shown that the behavior of the mechanism actuator system is controlled by certain dimensionless system parameters. Dissert. Abstr.

N82-12376 Iowa State Univ. of Science and Technology, Ames.
PREDICTION OF THE INCOMPRESSIBLE FLOW OVER A REARWARD-FACING STEP Ph.D. Thesis
O Key Kwon 1981 335 p
Avail: Univ. Microfilms Order No. 8122533

A viscous inviscid interaction scheme is presented for computing steady, two dimensional, incompressible, laminar, and turbulent flows over a rearward-facing step. The boundary layer equations for the region of viscous flow and the Laplace equation for streamfunction in the region of inviscid flow are used. The boundary layer continuity and momentum equations are solved inversely in a coupled manner using an improved finite-difference calculation procedure. Consideration is given to the applicability of the boundary layer equations to two dimensional channel expansion flows with developed inlet velocity profiles. No inviscid flow region can be identified so that the viscous inviscid interaction procedure is not applicable. Predictions of laminar flows of this type using the inverse boundary layer numerical method are shown to be in agreement with existing Navier-Stokes solutions and experimental measurements. Dissert. Abstr.

N82-12377 New Jersey Inst. of Tech., Newark.
DEPOSITION OF PARTICLES IN VERTICAL CONDUITS DUE TO ELECTROSTATIC CHARGE, DIFFUSION, AND GRAVITY Ph.D. Thesis
Melvin Wilbur Gelber 1981 99 p
Avail: Univ. Microfilms Order No. 8121967

The effect on the deposition of fine particles in a vertical channel and in a vertical tube due to the influence of electrostatic charge, diffusion, and gravity acting in the direction of flow is investigated. The flow considered was laminar, incompressible and steady. The flow patterns considered were uniform, developing and fully developed with symmetry about the axis of the channel or tube. Dissert. Abstr.

N82-12378 State Univ. of New York at Stony Brook.
EXPERIMENTAL AND ANALYTICAL STUDY OF NATURAL CONVECTION HEAT TRANSFER OF INTERNALLY HEATED FLUIDS Ph.D. Thesis

George Alanson Greene 1981 137 p
Avail: Univ. Microfilms Order No. 8121481

Boundary heat transfer from a liquid pool with a uniform internal heat source to a vertical or inclined boundary was investigated. In an open rectangular liquid pool in which the internal heat source was generated by electrical heating. The local heat flux was measured to a boron nitride test wall which was able to be continuously inclined from vertical. Under the assumption of laminar natural convection, it was found that the local heat transfer data could be empirically correlated by the relation Nu(x) = 0.153 Ra(x) to the 0.25 power with a standard deviation in the coefficient of + or - 14%, and the average heat transfer data could be empirically correlated by bar Nu = 0.127Ra(L) to the 0.25 power with a standard deviation in the coefficient of + or - 8%. The component of the gravitational acceleration along the wall, was found to help account for the inclination of the boundary although some systematic effect was still evident in the data. Dissert. Abstr.

N82-12379 State Univ. of New York at Buffalo.
ANALYTICAL SOLUTION OF ANISOTROPIC HEAT CONDUCTION IN SIMPLE AND IRREGULAR REGIONS Ph.D. Thesis
Shyan-Cherng Huang 1981 416 p
Avail: Univ. Microfilms Order No. 8122172

The general theory of heat conduction in anisotropic media homogeneous in rectangular Cartesian coordinates is first presented in a systematic manner through the use of coordinate transformation and Green's functions. The Levi's function and its extension in the theory of partial differential equations are derived. Several problems which cannot be solved straightforwardly by standard techniques in the solutions of isotropic problems are solved exactly. Two-dimensional steady-state problems in arbitrarily shaped regions are solved by the use of approximate Green's functions. Variational method is employed for unsteady state problems. The limitations of its applicability to general boundary and initial conditions are discussed by numerical examples. Exact solutions of number of steady and unsteady state problems with mixed-type boundary conditions are obtained. The Wiener-Hopf technique is applied. The accuracy of the kernel approximation is discussed. Dissert. Abstr.

N82-12380 Cornell Univ., Ithaca, N. Y.
THE TRANSITION FROM DEFLAGRATION TO DETONATION Ph.D. Thesis
Donald Scott Stewart 1981 209 p
Avail: Univ. Microfilms Order No. 8119439

A unified, mathematical description of all steady, one-dimensional combustion waves, deflagrations and detonations, and the unsteady flame acceleration process inherent in DDT is presented. A set of equations governing one-dimensional, unsteady combustion using the mathematical limit in which the activation energy of Arrehnius kinetics becomes large compared to the thermal energy of the gas were analyzed. The problem posed by activation-energy asymptotics (AEA) is discussed generally and in the simpler, particular case where the heat release during chemical reaction is small. Dissert. Abstr.

N82-12381 Catholic Univ. of America, Washington, D.C.
A STUDY OF TIME EVOLUTION OF CONTINUOUS VORTEX LOOPS IN A HOMOGENEOUS OR STRATIFIED FLUID Ph.D. Thesis
Chiou-Hsin Peter Cheng 1981 93 p
Avail: Univ. Microfilms Order No. 8120149

A numerical study was made to simulate the time evolution of a series of vortex loops in a homogeneous or stratified fluid. The physical models for vortex structure in the wake of a three dimensional body are presented and investigated. The closed-end double helix is found to be a reasonable representation of the vortex structure behind a three-dimensional body. An existing self-consistent theory of vortex loops is applied and the vortex structure is conceived as vortex loops resembling the configuration of a closed-end double helix. It was found that the vortex structure in the wake of a spanwise elongated body approaches the well-known two-dimensional case of the Karman vortex street. The simulated features of the wake collapse in a stratified fluid are obtained, and the three-dimensional wake structure is compared with the previously published experimental results. Dissert. Abstr.

N82-12382 Ecole Polytechnique Federale de Lausanne (Switzerland). Inst. de Thermique Appliquee et de la Chaire de la Mecanique de la Turbulence.
CALCULATION AND MEASUREMENT OF THE TURBULENCE OF AN INCOMPRESSIBLE FLOW IN A LABYRINTH SEAL BETWEEN A ROTATING SHAFT AND A CYLINDER AT REST Ph.D. Thesis [CALCUL ET MESURE DE LA TURBULENCE D'UN ECOULEMENT INCOMPRESSIBLE DANS LE LABYRINTHE ENTRE UN ARBRE EN ROTATION ET UN CYLINDRE STATIONNAIRE]
Horst Stoff Zurich Juris-Verlag 1979 169 p refs In FRENCH; ENGLISH summary
(EPFL-ITA-8; ISBN-3-260-04775-1) Avail: Issuing Activity

Axisymmetric flow is computed with a pressure/velocity code in order to explain leakage phenomena against the mean pressure gradient. The main circumferential flow induces a secondary mean flow vortex pattern inside annular cavities on the surface of the shaft. One such cavity (in a model) is examined by comparing the finite difference result of a computer program with measurements obtained by a backscattering laser Doppler velocimeter. At a cavity Reynolds number of 30,000 and a Taylor number of 10,000 the boundary layers are 10% of the cavity width and the mean circumferential bulk velocity is 60% of the shaft rotation velocity. The probability density distribution of the circumferential velocity is gaussian outside the boundary layers with a degree of turbulence of < 5%. The energy spectrum shows the isotropic dissipation of the order of magnitude of the computation whereas the autocorrelation function indicates values smaller by one order of magnitude. The mean velocity field is well represented by the numerical computation. Author (ESA)

N82-12383 Karlsruhe Univ. (West Germany). Ausbreitungs- und Transportvorgaenge in Stroemungen.
CALCULATION OF ANNULAR AND TWIN PARALLEL JETS USING VARIOUS DISCRETIZATION SCHEMES AND TURBULENCE MODEL VARIANTS
M. A. Leschziner and W. Rodi Feb. 1980 24 p refs
(KU-SFB-80/T/159) Avail: Issuing Activity

Numerical and experimental predictions are compared for (1) the hybrid upwind/central differencing scheme, (2) the hybrid skew-upwind/central differencing scheme, and (3) the quadratic, upstream-weighted differencing scheme. The turbulence models examined are the standard k-epsilon model and two variants. The first accounts for effects of stream-line curvature on turbulence and the second for the prefential influence of normal stresses on the dissipation of turbulence energy. Numerical scheme (1) particularly in conjunction with turbulence model modifications, results in severe solution errors and in a generally anomalous response to changes in the modelled viscosity field. In contrast, in all cases, schemes (2) and (3) yield, similar results and respond in an expected manner to the modifications. The modifications, particularly the one that accounts for streamline curvature, reduce, in some cases drastically, the discrepancies between computed and experimental data. Satisfactory results are obtained for both jets examined. Author (ESA)

N82-12384# National Aerospace Lab., Tokyo (Japan). Second Aerodynamics Div.
A SECOND-ORDER ACCURATE PROCEDURE FOR SOLVING THE BOUNDARY LAYER EQUATIONS BASED ON THE PREDICTOR-CORRECTOR FORM OF THE CRANK-NICOLSON SCHEME
Kenichi Matsuno Jun. 1981 13 p refs
(NAL-TR-655T) Avail: NTIS HC A02/MF A01

The numerical accuracy of a predictor-corrector form of the Crank-Nicolson scheme for solving boundary layer equations is examined. The Crank-Nicolson Scheme, with a predictor-corrector step to deal with nonlinearity, exhibits only first-order accuracy unless the boundary layer continuity and momentum equations are solved in a coupled manner. A predictor-corrector form of the Crank-Nicolson scheme, based on a coupled solution for the continuity and momentum equations, is presented for both the incompressible and compressible flows. The present scheme was subjected to a computer experiment using the problem of the laminar boundary layer development in a linearly retarded edge

velocity field. The results are compared with the Davis coupled scheme. It is shown that the present scheme posesses second-order accuracy and is more efficient than the Davis coupled scheme. R.J.F.

N82-12385# National Aerospace Lab., Tokyo (Japan).
ON THE FLOW MEASUREMENTS AND VELOCITY VECTOR ANALYSIS USING FIVE-HOLE PITOT TUBES
Hideaki Nishimura 1981 29 p Partly in JAPANESE; partly in ENGLISH
(NAL-TR-668; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Five-hole pitot tubes are widely used to determine directions and magnitudes of velocities in three dimensional flow fields, because of their simplicity in handling and their reliability. A method of reducing data obtained from five-hole pitot tube measurements with the aid of a few sets of calibration daa is described. By using mini-computers, pitch and yaw angles and Mach numbers of flows can be computed simultaneously by this method with reasonable accuracy in the range of the pitot tube calibration. Author

N82-12386*# Calspan Advanced Technology Center, Buffalo, N.Y. Aerodynamic Research Dept.
AN EXPERIMENTAL STUDY OF MASSIVE BLOWING FROM A NOSETIP DURING JOVIAN ENTRY Final Report, Sep. 1979 - Dec. 1980
M. S. Holden Hampton, Va. NASA. Langley Research Center Nov. 1981 60 p refs
(Contract NAS1-15948)
(NASA-CR-165756; CALSPAN-6593-A-1) Avail: NTIS HC A04/MF A01 CSCL 20D

The fluid dynamic structure and stability of the boundary layer and shock layer ahead of a highly blowing heat shield in an environment simulating entry into the Jovian atmosphere were investigated. The experimental studies were conducted in the Calspan 96 in shock tunnel with a freestream of a H2/He mixture at Mach numbers above 10. Measurements of heat transfer and pressure were made on the porous model surface, and high-speed schlieren photography was used to examine the structure and stability of the shock layer. Results are presented which show how the heat transfer and shock layer stability vary for gases of different molecular weights for a range of Reynolds numbers and mass-addition rates. M.G.

N82-12387*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A TITLE-GAP FLOW MODEL FOR USE IN AERODYNAMIC LOADS ASSESSMENT OF SPACE SHUTTLE THERMAL PROTECTION SYSTEM: PARALLEL GAP FACES
Douglas L. Dwoyer, Perry A. Newman, Frank C. Thames, and N. Duane Melson Oct. 1981 78 p refs
(NASA-TM-83151) Avail: NTIS HC A05/MF A01 CSCL 20D

The problem of predicting aerodynamic loads on the insulating tiles of the space shuttle thermal protection system (TPS) is discussed and seen to require a method for predicting pressure and mass flux in the gaps between tiles. A mathematical model of the tile-gap flow is developed, based upon a slow viscous (Stokes) flow analysis, and is verified against experimental data. The tile-gap pressure field is derived from a solution of the two-dimensional Laplace equation; the mass-flux vector is then calculated from the pressure gradient. The means for incorporating this model into a lumped-parameter network analogy for porous-media flow is given. The means for incorporating this model into a lumped-parameter network analogy for porous-media flow is given. The flow model shows tile-gap mass flux to be very sensitive to the gap width indicating a need for coupling the TPS flow and tile displacement calculation. Analytical and experimental work to improve TPS flow predictions and a possible shuttle TPS hardware modification are recommended. A.R.H.

N82-12388*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
HADY-I, A FORTRAN PROGRAM FOR THE COMPRESSIBLE STABILITY ANALYSIS OF THREE-DIMENSIONAL BOUNDARY LAYERS Final Report
Nabil M. El-Hady Washington NASA Sep. 1981 118 p refs
(Grant NsG-1645)
(NASA-CR-3467) Avail: NTIS HC A06/MF A01 CSCL 20D

A computer program HADY-I for calculating the linear incompressible or compressible stability characteristics of the laminar boundary layer on swept and tapered wings is described. The eigenvalue problem and its adjoint arising from the linearized disturbance equations with the appropriate boundary conditions are solved numerically using a combination of Newton-Raphson interative scheme and a variable step size integrator based on the Runge-Kutta-Fehlburh fifth-order formulas. The integrator is used in conjunction with a modified Gram-Schmidt orthonormalization procedure. The computer program HADY-I calculates the growth rates of crossflow or streamwise Tollmien-Schlichting instabilities. It also calculates the group velocities of these disturbances. It is restricted to parallel stability calculations, where the boundary layer (meanflow) is assumed to be parallel. The meanflow solution is an input to the program. M.G.

N82-12389# Douglas Aircraft Co., Inc., Long Beach, Calif.
COMPUTATION OF GENERAL TWO-DIMENSIONAL STEADY VISCOUS FLOWS
P. G. Williams and Tuncer Cebeci Jul. 1981 42 p refs
(Contract N00019-80-C-0036)
(AD-A105232; MDC-J2248) Avail: NTIS HC A03/MF A01 CSCL 20/4

In a previous report it was shown that a code based on the biharmonic formulation of the Navier-Stokes equations with the corresponding Newtonized difference equations solved by a direct band solver could be quite competitive in situations where considerably more grid points are used in one direction than in the other, such as flow in a long channel. The main advantages of this approach are that it is straightforward and robust. Both of these terms are subjective of course. To justify the first we may summarize the approach as follows: From derivative coefficients generated for the x and y variable grids we can immediately write down the difference equations and it is then a simple matter to write down the Newton equations. The coefficients are stored by diagonals as required by the band solver and the righthand sides computed, then the Newton corrections are obtained by calls to the band solver. Also the uniformity of the approach used for introducing the boundary conditions in section 4 simplifies the treatment of a wide variety of boundary conditions. GRA

N82-12390# University of Southern California, Los Angeles. Dept. of Aerospace Engineering.
ON THE MANIPULATION OF SPREADING RATES OF FORCED MIXING LAYERS Technical Report, 1 Jul. 1980 - 30 Jun. 1981
Chih-Ming Ho and Yu-Quan Zhang Sep. 1981 5 p refs
(Contract N00014-77-C-0314)
(AD-A105236) Avail: NTIS HC A02/MF A01 CSCL 20/4

The vortex merging in a mixing layer can be modified by applying periodic forcing at the origin. When the forcing parameters (frequency, amplitude as well as phase difference between fundamental and subharmonic) varies, the pattern of vortex merging changes. Consequently, the spreading rate of the mixing layer can be manipulated. The effect of each forcing parameter on the change in the spreading is discussed in the present paper. Author (GRA)

N82-12391# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
ADVECTIVE EFFECTS IN THE NUMERICAL SIMULATION OF LONG PERIOD, LARGE AMPLITUDE WAVE BEHAVIOR Final Report, Nov. 1977 - Sep. 1981
H. Lee Butler Sep. 1981 35 p refs
(AD-A105231; WES/MP/HL-81-4) Avail: NTIS HC A03/MF A01 CSCL 20/4

Numerical modeling of water-wave behavior has progressed rapidly in the last decade and is now generally recognized as a useful tool capable of providing solutions to many coastal problems. The U. S. Army, through various agencies, has sponsored development of two-dimensional numerical models for simulating long period wave behavior. Many of these models have included the advective terms in their formulation. Demonstrated in numerous papers throughout the literature, inclusion

of advective effects can lead to instabilities in the solution. This fact was exemplified in the work of Sloss (1972) in his attempt to include these effects in storm surge simulation. The primary objective of this investigation was the assessment of the role of advective terms in the numerical simulation of long period, large amplitude wave behavior. A major effort in accomplishing this objective was the development of an appropriate representation of the non-linear terms in the difference equations of motion. To this end, a stabilizing correction, double sweep implicit scheme was encoded into an existing and extensively used hydrodynamic model, WIFM. The scheme manifested a high degree of stability in various numerical flume tests. GRA

N82-12392# ARO, Inc., Arnold Air Force Station, Tenn.
AN INVESTIGATION OF F-16 NOZZLE-AFTERBODY FORCES AT TRANSONIC MACH NUMBERS WITH EMPHASIS ON MODEL SCALE EFFECTS Final Report, Oct. 1979 - Sep. 1980
Earl A. Price, Jr. Sep. 1981 149 p refs
(AD-A104905; AEDC-TR-80-57; AFWAL-TR-81-2110) Avail: NTIS HC A07/MF A01 CSCL 20/4

An experimental program was conducted to provide nozzle-afterbody data with a minimum interference support system on a 0.25-scale F-16 model and to determine the interference induced on then nozzle-afterbody region by sting and strut model support systems. Data obtained on the 0.25-scale model are compared with data from a 0.11-scale model for evaluation of model scale effects. The investigation was conducted over the Mach number range from 0.6 to 1.5. Data are presented in terms of coefficients and increments in coefficients of nozzle-afterbody axial and normal forces obtained from integrating pressure data. High-pressure air at ambient temperature was utilized for exhaust plume simulation. The results indicate close agreement in axial-force coefficient between configurations having full and annular nozzles at design pressure ratio. Very little effect of Reynolds number was found on the nozzle-afterbody axial force. Wave interference adversely affected axial-force data from the 0.25-scale model at Mach numbers between 1.0 and 1.1, producing lower axial force on the model afterbody. Large differences were determined in both the magnitude and the sign of strut interference from the two model installations. Author (GRA)

N82-12393# Pennsylvania State Univ., University Park. Applied Research Lab.
OBSERVATIONS OF THE EFFECTS OF BOUNDARY LAYER AND NUCLEI ON CAVITATION OF AXISYMMETRIC BODIES
J. A. Carroll 13 Feb. 1981 225 p refs
(Contract N00024-79-C-6043)
(AD-A104779; ARL/PSU-TM-81-60) Avail: NTIS HC A10/MF A01 CSCL 20/4

An investigation of limited cavitation was conducted on three different axisymmetric models. Test models included a hemispherical nose, a Schiebe nose, and a David Taylor Naval Ship Research and Development Center (DTNSRDC) nose. All models had a 2.0-in. diameter. Theoretical pressure distribution calculations and laminar boundary layer growth calculations were performed for the above models which were subsequently tested and also for a 1.5-caliber ogive nose, a 1.0-caliber ogive nose, and an International Towing Tank Conference (ITTC) nose to serve as supplementary information. The test models were chosen in accordance with their boundary layer flow characteristics. Laminar boundary layer separation was predicted to occur on the hemispherical nose for all test velocities. Calculations for the Schiebe nose indicated that laminar boundary layer separation does not occur and, therefore, this model exhibits an attached boundary layer for all velocities Laminar separation was predicted for the DTNSRDC nose; however, this model has a relatively low critical Reynolds number. As a result, the DTNSRDC nose exhibits laminar separation at low velocities and an attached boundary layer at high velocities. GRA

N82-12394# Pennsylvania State Univ., University Park. Applied Research Lab.
IN-DUCT VISCOUS FLOW PRESSURE DISTRIBUTION ON A BODY WITH BOUNDARY LAYER CONTROL
G. C. Lauchle 10 Aug. 1981 30 p refs
(Contract N00024-79-C-6043)
(AD-A105396; ARL/PSU-TM-81-165) Avail: NTIS HC A03/MF A01 CSCL 20/4

It is well known that the static pressure distribution of an axisymmetric body operating within the boundaries of a duct such as a wind or water tunnel test section is altered from that observed in a free stream because of solid blockage and horizontal buoyancy effects. Because potential flow solutions can account only for the solid blockage, auxiliary analysis must be performed to account for the viscous (horizontal buoyancy) effects. One such analysis has been performed by this author, where it was assumed that boundary layer development occurred in a natural, flat plate-like manner over the test body and duct walls. In this report, a modification of that analysis is presented which permits one to analyze bodies with boundary layer control. In addition to the theoretical formulation, a numerical example is presented to illustrate the effect on the pressure distribution of a 0.318 m diameter body with surface suction operating in a 1.22 m diameter duct. Author (GRA)

N82-12395# Oak Ridge National Lab., Tenn. Computer Sciences Div.
QUASI-STATIONARY APPROXIMATION FOR THE STEFAN PROBLEM WITH A CONVECTIVE BOUNDARY CONDITION
A. D. Solomon, D. G. Wilson, and V. Alexiades Sep. 1981 40 p refs
(Contract W-7405-eng-26)
(DE81-030372; ORNL/CSD-84) Avail: NTIS HC A03/MF A01

It is shown the solution to the Stefan problem with a convective boundary condition tends to the quasi-stationary approximation are given, and some examples are presented. DOE

N82-12396# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
STUDY OF ATES THERMAL BEHAVIOR USING A STEADY FLOW MODEL
Christine Doughty, Goeran Hellstroem, Chin Fu Tsang, and Johan Claesson (Lund Inst. of Tech.) Jan. 1981 79 p refs
(Contract W-7405-eng-48)
(DE81-030883; LBL-11029; PNL-3924) Avail: NTIS HC A05/MF A01

The thermal behavior of a single well aquifer thermal energy storage system in which buoyancy flow is neglected is studied. A dimensionless formulation of the energy transport equations for the aquifer system is presented, and the key dimensionless parameters are discussed. A simple numerical model is used to generate graphs showing the thermal behavior of the system as a function of these parameters. Some comparisons with field experiments are given to illustrate the use of the dimensionless groups and graphs. DOE

N82-12397# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DESIGN ANALYSIS OF SUPPLEMENTAL HEATING SYSTEMS Final Report
Sep. 1981 239 p refs
(Contract DE-AC03-80ER-52058)
(DE81-030678; DOE/ER-52058/T1) Avail: NTIS HC A11/MF A01

Program priorities for the development of the heating techniques, particularly reactor heating systems are evaluated. Each technique is evaluated against a set of selection criteria. The selection criteria include: the status of the theory; the status of the technology; system efficiency; cost; susceptibility to radiation, maintainability; and critical real estate requirements. DOE

N82-12398# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DESIGN ANALYSIS OF SUPPLEMENTAL HEATING SYSTEMS Final Report
Sep. 1981 13 p
(Contract DE-AC03-80ER-52058)
(DE82-030677; DOE/ER-52058/T1) Avail: NTIS HC A02/MF A01

Tokamak supplemental heating techniques are studied.

Conceptual designs for reactor level heating systems are developed. Ion cyclotron radiation heating and negative ion beams are selected. DOE

N82-12399# General Electric Co., St. Petersburg, Fla. Fluid Mechanics and Combustion Branch.

LAMINAR-FLOW-CYCLONE DEVELOPMENT PROGRAM Final Technical Report, 1 Nov. 1978 - 31 May 1981

W. B. Giles Jun. 1981 96 p refs

(Contract DE-AC21-78ET-11031)

(DE81-001297; DOE/ET-11031/T1; FE-3242-33) Avail: NTIS HC A05/MF A01

The feasibility of maintaining laminar flow in a cyclone separator was investigated. Various experimental models were used to simulate the essential flow requirements, and observations were conducted on the turbulent-laminar character of the flow. From this, it was concluded that laminar flow could be maintained up to relatively high Reynolds numbers in the radially-inward swirl flow regime. However, a large-scale instability occurs in turning to the axial swirlflow regime. All present attempts to suppress this instability failed, and the investigation was terminated. DOE

N82-12400# Oak Ridge National Lab., Tenn. Chemical Technology Div.

MEASUREMENT OF THERMAL CONDUCTIVITIES IN COAL FLUIDS

C. S. Chang, J. B. Bader, and J. L. Plawsky Sep. 1981 52 p refs

(Contract W-7405-eng-26)

(DE82-000523; ORNL/MIT-334) Avail: NTIS HC A04/MF A01

As a qualification of a transient hot wire, thermal conductivity cell for use on the Coal Liquids Flow System, the thermal conductivity of toluene was mesured between 25 and 850 C. Static measurements over a 4-sec time span yielded a thermal conductivity at 250 C of 0.12607 W/m-K and a slope of thermal conductivity vs temperature of -272.8 W/m-K (squared). All results are within 2 to 5% of the most recent literature data. An experimental error analysis showed all errors to be less than 1%. Dynamic-mode measurements in which flow through the cell was interrupted only for the measurement period agreed within experimental accuracy with the static-mode measurements, demonstrating that the hot-wire cell is immediately applicable to coal-slurry thermal-conductivity measurements in the Coal Liquids Flow System. Sedimentation experiments showed that settling should have a negligible effect on thermal-conductivity measurements over the time period envisioned for measurement. Excellent agreement was obtained between previous measurements of thermal conductivities of coal slurries and the predictions of the Rayleigh equation for heterogeneous-mixture thermal conductivities. DOE

N82-12401# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

RING EDDY FLOW METAMORPHOSIS AS A BASIS FOR IMPLOSION OF PARTIAL VACUUMS, SCHWENK'S DROP PICTURE METHOD AND CUTTING BY MEANS OF A WATER JET [DIE RINGWIRBELMETAMORPHOSE ALS GRUNDLAGE DER IMPLOSION VON KAVITATIONSBLASEN, DER SCHWENKSCHEN TROPFENBILDMETHODE UND DES WASSERSTRAHLSCHNEIDENS]

Peter E. M. Schneider Aug. 1980 66 p refs In GERMAN (MPIS-13/1980; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,55

The flow characteristics of ring eddies were experimentally investigated in order to explain materials erosion by cavitation. A literature review is presented and a ring eddy experiment is described. It was demonstrated that the implosion of partial vacuums (cavitation bubbles) occurs inside gaseous or fluid ring eddies passing over from laminar into turbulent flow resulting in a bubble jet capable of eroding solid materials. In the unstable vortex flow between colder gas core and warmer surrounding fluid an important temperature difference develops, heating the material and contributing to its erosion. The invarying degrees of periodicity, shaping and reshaping of secondary bubbles, helix and double-helix-like flows in the vortices probably contribute to cavitation noise. Author (ESA)

N82-12402# Fraunhofer-Inst. fuer Bauphysik, Holtzkirchen (West Germany). Inst. fuer Bauphysik.

THE WINDOW AND ITS HEAT BALANCE CONSIDERING SOLAR RADIATION AND ADDITIONAL INSULATION MEASURES Final Report

Helmut Kuenzel and Christine Snatzke Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 27 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-070; B-HO-4/77; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,70

Tests were carried out with a common wooden framed window with clear-glass double glazing to determine the improvement of the transmission coefficient when shades, shutters, or curtains are used at night. During daytime remarkable gains of heat are obtained from solar radiation through windows. Taking into consideration day and nightime of the 12 day test period, more than 30 % of heating capacity is saved. The threshold value of solar radiation, for which gain of heat was equal to loss of heat, is found for the tested exterior wall surface at about 200W/sq m and for the clear glass double glazing at just 100W/sq m the difference of temperature between room air and outside air being 20k. The results can only be applied to conditions prevailing in the test rooms. However, based on these results, it can be stated that the heat balance of the window is favorably influenced by solar radiation especially through south windows, as well as by adequate insulation measures during the night (shades, curtains). Author (ESA)

N82-12403# Weiss Technik G.m.b.H., Reiskirchen (West Germany).

PRACTICAL DEMONSTRATION OF HEAT PUMPS FOR UTILIZATION OF ANIMAL-GENERATED HEAT Final Report

Hans-Ulrich Amberg Bonn Bundesministerium fuer Forschung und Technologie Sep. 1980 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-100; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,30

Airconditioning of pigpens to eliminate effects of temperature extremes is reported. A stall air conditioner was installed as heat pump in a pigpen for final fattening. The heat, recovered from the exhaust air, is supplied to the outside air so that heated fresh air is blown into the stall. The test was accomplished on a farm with intensive pig breeding with 120 preliminary fattening places and 240 final fattening places. The stall air conditioner offers the possibility to attenuate the extreme temperature variations during the year. Author (ESA)

N82-12404# Escher Wiss G.m.b.H., Ravensburg (West Germany). Abt. Papiermaschinen.

AIR CIRCUIT WITH HEATING PUMP Final Report

Herbert Holik, Hans Joachim Bauder, Hubert Brugger, Anton Reinhart, and Karl-Heinz Spott Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-188; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

A pump which draws energy from exhaust air from a paper drying process to heat up the blow air was studied. The use of a heat pump instead of a steam heated exchanger can reduce primary energy consumption for blown air heating by more than half and the costs for air heating up to half. The amortization times for the heat pump extend from 5 to 10 years. Since in the pulp and paper industry, amortization times of less than two years are required for such relatively small investments, the heat pump so far is only used to heat blown air under highly favorable conditions. The rising energy prices shorten the heat pump amortization time. The 100% fuel price increase brought the heat pump with diesel engine drive already to very favor-

able amortization times of 2 to 5 years. A 20% increase will make the heat pump economically advantageous with an amortization time between 1 and 2 years. Author (ESA)

N82-12405# Gesellschaft fuer Systemtechnik m.b.H., Essen (West Germany).

BASIC INVESTIGATIONS OF AN ABSORPTION HEAT PUMP, USING HEAT OF MEDIAN TEMPERATURE (HEAT TRANSFORMER) Final Report

Paul Franzen, Hans Herrmann, Chahpar Mostofizadeh, Horst Schinke, Dieter Seher, and Karl Stephan Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 305 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-013; ISSN-0340-7608) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 46,90

It is noted that heat transformer circuits enable temperature rises without requiring any real high grade energy. The fundamental thermodynamics are described, and an outline of the present state of technology and of previous work in the field of heat transformer circuits is presented. In order to assess their suitability for the execution of this process, work media and plant concepts and components were looked at. Besides the thermodynamic construction of one and two stage plants, the applicability of the system was analyzed using laboratory equipment, and the application potential and productiveness of heat transformer circuits were estimated. From the results of these theoretical and experimental studies it is deduced what research and development work will be necessary for the further development of the system. Author (ESA)

N82-12406# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

LATERAL MIGRATION OF NEUTRALLY BUOYANT RIGID SPHERES IN SMALL DUCTS

Andreas Heertsch Nov. 1980 70 p refs In GERMAN; ENGLISH summary

(MPIS-20/1980; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,65

Velocity profiles were measured with a laser Doppler velocimeter in microducts for rigid spheres suspended in water to study blood flow in capillary tubes. Assuming Hagen-Poiseuille flow, concentration distribution in terms of number density over wall distance are obtained. Distributions indicate that the particles assemble at a stable position at a quarter duct width from the wall. No further lateral particle migration away from this stable position is observed. Particles, entering the duct near its centers reach this stable position within a downstream distance, which is 5.7 times longer than the corresponding distance for particles entering the duct near the wall. It is found that these distances are proportional to the ratio duct width/particle size. Optical observations of particle traces are also discussed.

Author (ESA)

N82-12407# Technische Hochschule, Aachen (West Germany). Inst. of Heat Transfer and Air Conditioning.

TECHNICAL HEAT AND FLOW INVESTIGATIONS INTO HEAT EXCHANGERS MADE OUT OF SYNTHETIC MATERIALS, FOR USE IN DRY COOLING TOWERS Final Report

Helmut Pollack Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 43 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-004; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8,70

Bare tube and flat heat exchangers (HE) made out of synthetic materials were investigated for use in dry cooling towers with natural draft. The advantages of synthetic maternals are higher corrosion resistance, easier workability and lower cost. Suitability tests were performed designing the total system based on HE and tower construction. It is shown that bare tube bundles composed of tube walls or hollow plates separated by plastic strips with wall thicknesses less than 0.6 mm are an alternative to finned tube HE's of metal. Assuming specific building costs of 330 DM/sqm for the tower shell and HE manufacturing costs of 20 DM/kg, several solutions can be found with slight differences in heat transfer conditions and total costs between 22 and 25.10E6 DM. Author (ESA)

N82-12408# Centre National de la Recherche Scientifique, Meudon (France). Lab. d'Aerothermique.

THE GRAVITY WAVE IN A LIQUID WITH A SURFACE FILM, IN THE PRESENCE OF AN APPLIED ELECTRIC FIELD

M. Dudeck and R. PrudHomme Jun. 1980 21 p refs

(Rept-80-2; Publ-620) Avail: NTIS HC A02/MF A01

The equation for the dispersion of a gravity wave is studied, using a simple electromagnetic model (no magnetic field, no polarization, electrical neutrality for the liquid and the gas). The surface is a medium possessing mass and inertia. The liquid behaves as a perfect fluid, allowing slippage of the film. A small amplitude disturbance was applied to the liquid. When the electric field is zero the two propagation modes are oscillatory and undamped (for $n >$ one where n is a nondimensional parameter tied to the film's elasticity). The evolution is hence stable. For $n <$ or equal to one, instability results. For a nonzero field and $n >$ one, instability is determined by the parameters of the field in the reference state. For $n <$ or equal to one the pattern of evolution is always unstable. Author (ESA)

N82-12409# British Aerospace Aircraft Group, Warton (England). Aerodynamics Dept.

COMPUTATIONAL FLUID MECHANICS AND ITS IMPACT ON THE AIRCRAFT AERODYNAMICIST

Barry Hunt 1981 45 p refs

(DGLR-Paper-81-3) Avail: NTIS HC A03/MF A01

The capabilities of current theoretical methods for predicting the more important types of aerodynamic flow are summarized. Their shortcomings as well as successes are indicated and the likelihood of their development and acceptance as routine, mainstream tools of the aircraft aerodynamicist is discussed. Navier-Stokes solutions, boundary layer solutions, and inviscid models are treated critically. Author (ESA)

N82-12410# Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik und Energiesysteme.

DEVELOPMENT OF AN IMPROVED HIGH PERFORMANCE ARTERY HEAT PIPE Final Report

H. Kraehling Paris ESA May 1981 30 p

(Contract ESTEC-4050/79/NL-AK)

(ESA-CR(P)-1459) Avail: NTIS HC A03/MF A01

An existing space-qualified arterial high performance heat pipe was improved. Attempts to cut grooves with a self made single point threading tool were not successful. The grooves were not deep enough, so that a sufficient liquid supply over the entire circumference in the heating zone could not be obtained. Employment of commercially available thread taps showed an improvement in the groove depth but the groove profile itself was still poor. A further improvement of the profile shape was attained with a special set of threading tools consisting of an entering tap and a plug tap. Performance measurements with respective artery heat pipes confirmed that the heat pipe performance became better with the improvement of the circumferential groove profile. However, all investigated circumferential groove designs revealed a definitely poorer performance than the standard design with a screenwick as a secondary capillary structure. Author (ESA)

N82-12411# Imperial Coll. of Science and Technology, London (England). Heat Transfer Div.

METHODS OF CALCULATING HEAT TRANSFER WITHIN THE PASSAGES OF HEAT EXCHANGERS

D. Brian Spalding Jul. 1981 13 p refs Presented at NATO Advanced Study Inst. Lectures, Ankara, 13-24 Jul. 1981

(HTS/81/4) Avail: NTIS HC A02/MF A01

Predictions of heat transfer and fluid flow processes within the passages of heat exchangers using: (1) experimental information generalized by dimensional analysis, (2) experimental information generalized by analogies between heat, mass and momentum transfer, (3) the methods of classical mathematics, and (4) numerical methods embodied in computer programs are considered. Practices (1) and (2) are becoming increasingly expensive while practice (3) remains of extremely limited utility. Practice (4) is increasing its power and reducing its costs as

new computers, computer programs and experimental information become available. The principles of the numerical approach to within-passage heat transfer and fluid flow are described together with some of the difficulties of implementation and methods of overcoming them. Predictive capability, however, remains insufficient for designers, especially in respect of turbulence complicated by low Reynolds number and two phase phenomena. Author (ESA)

N82-12412# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.

THE CALCULATION OF HEAT EXCHANGER PERFORMANCE

D. Brian Spalding Jul. 1981 16 p refs Presented at NATO Advanced Study Inst., Ankara, 13-24 Jul. 1981

(HTS/81/5) Avail: NTIS HC A02/MF A01

The general principles of the numerical approach to computation of heat exchanger performance are outlined. Attention is given to several specific topics: (1) how partial elimination can accelerate convergence; (2) a solving scheme for linear equations; (3) the ways in which the velocity components for interpenetrating continua can be defined; and (4) how resistances to flow, such as baffles and tube support plates, are allowed for. The advantages of the method are that transient phenomena can be predicted as well as the steady state; temperature dependent and otherwise nonuniform transfer coefficient data can be handled; unusual flow patterns can, if known, be allowed for; unknown flow patterns, and their influence on the heat transfer performance, can be computed; reciprocal interactions of the temperature and velocity fields, such as those resulting from buoyancy effects, can be correctly taken into account; and two and three dimensional variations of temperature and other flow variables can be allowed for. Author (ESA)

N82-12413# Imperial Coll. of Science and Technology, London (England). Centre for Computational Fluid Mechanics, Heat Transfer and Combustion.

NUMERICAL COMPUTATION OF TWO PHASE FLOW IN GUN BARRELS

D. Brian Spalding Jun. 1981 17 p refs Presented at US Army Workshop on Multi-Phase Flow, Aberdeen, Maryland, 2-4 Feb. 1981

(HTS/81/6) Avail: NTIS HC A02/MF A01

There are three or four imdependent variables and seventeen or more independent ones involved in the computer simulation of gun-barrel phenomena which is recognized as transient compressible, two-phase flow in a moving cordinate system. Two cmputer programs for predicting the distributions of velocities, pressures, and temperatures are reviewed. The major obstacle to making realistic predictions is ignorance of the precise laws governing interphase transport, turbulent mixing, particle-particle and particle-wall impacts, and chemical kinetics. It is argued that numerical modeling conducted at the particle-scale level, can be helpful. Numerical computations on grids of subparticle size confirm friction, heat transfer, and mass transfer laws. Hypotheses are needed for turbulence and particle impact. A.R.H.

N82-12414# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

SELF-INDUCED PULSATING LIQUID FLOW IN A HYDRAULIC SYSTEM

Gerd E. A. Meier and Andrzej P. Szumowski Dec. 1980 49 p refs

(MPIS-15/1980; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,35

Pulsating liquid flow of large amplitude in a system containing a tank, a tube and a valve which has an elastically supported plate is investigated. The functions of the flow properties versus some nondimensional parameters were found. These parameters depend on supply pressure, inertia of the liquid and of the valve as well as on the elasticity of the plate support and the dimensions of the system. The occurrence of cavitation zones in the liquid flow is taken into account. Theoretical and experimental results are compared. Both show that the amplitude of the pressure can exceed supplied pressure. Author (ESA)

N82-12415# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

PROPAGATION ON FINITE DISTURBANCES IN THE BOUNDARY LAYER

Geert Zimmermann Mar. 1981 40 p refs

(MPIS-3/1981; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

Amplitude disturbances at large Reynolds numbers are considered. They are assumed to be wave like. A two scale expansion leads, in the lowest order of the Reynolds number, to a nonlinear eigenvalue problem for the local wave shapes and an integral condition for the long range development of these waves. Local conditions are engendered by evaluation of this integral condition. These help solve the eigenvalue problem. Waves over longer propagation ranges are shown to be asymptotic by the results of the evaluation of the propagation equation in the vicinity of the critical stream line. Author (ESA)

N82-12416# European Space Agency, Paris (France).

A SOLUTION OF THE NAVIER-STOKES EQUATIONS BY A MIXED FINITE ELEMENT METHOD Thesis

Marc Bredif Sep. 1981 109 p refs Transl. into ENGLISH of "Resolution des Equations de Navier-Stokes par une Methode d'Elements Finis Mixtes", ONERA, Paris Report ONERA-NT-1981-1, 1981 Original report in FRENCH

(ESA-TT-720; ONERA-NT-1981-1) Avail: NTIS HC A06/MF A01

The numerical treatment of steady state, two-dimensional Navier-Stokes equations in the incompressible case is studied. The approximation method retained is the mixed finite element method, as regards stream function and vortex function. The improvements to this formulation are: possibility of choice of boundary conditions of various types; introduction of a finite element formulation of the stagnation pressure calculation; definition of a corrected formulation with a view to studying laminar flows in the case of large Reynolds numbers. The chosen formulation is discussed theoretically, encompassing the aspects mentioned. A solution algorithm is presented, based on a general conjugate gradient method; numerical results are presented for various cases of viscous, incompressible, laminar flows: (1) in a square cavity; (2) around a circular cylinder; and (3) around a NACA 0018 profile at zero angle of attack for Reynolds numbers up to 5000. Author (ESA)

N82-12112*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

GEOPHYSICAL FLUID DYNAMICS

William W. Fowlis *In its* Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 25-31 refs (For primary document see N82-12109 03-18)

Avail: NTIS HC A10/MF A01 CSCL 20D

N82-12116*# Tennessee Univ. Space Inst., Tullahoma.

TWO-PHASE FLOW AND HEAT TRANSFER UNDER LOW GRAVITY

Walter Frost *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 43-57 refs (For primary document see N82-12109 03-18)

Avail: NTIS HC A10/MF A01 CSCL 20D

N82-12119*# Case Western Reserve Univ., Cleveland, Ohio.

CONVECTION IN FLUIDS AT REDUCED GRAVITY

Simon Ostrach *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 69-95 (For primary document see N82-12109 03-18)

Avail: NTIS HC A10/MF A01 CSCL 20D

N82-12120*# Rochester Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.

EFFECTS OF SPACECRAFT MOTIONS ON FLUIDS EXPERIMENTS

Roger F. Gans *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 96-102 refs (For primary document see N82-12109 03-18)

Avail: NTIS HC A10/MF A01 CSCL 20D

N82-12121*# National Aeronautics and Space Administration, Washington, D. C.
TRANSIENT THERMAL CONVECTION IN MICROGRAVITY
Robert F. Dressler *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 103-112 refs (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-12417 New Jersey Inst. of Tech., Newark.
STATISTICAL AVERAGING IN POSITION DETERMINATION BY HOLOGRAPHY UNDER TURBULENCE CONDITIONS Ph.D. Thesis
Paul Aloysius McGovern 1981 153 p
Avail: Univ. Microfilms Order No. 8121969

An investigation of several, disparate phenomena was conducted with the aim of developing a surveying system capable of overcoming the limitations imposed by turbulence in modern surveying. This method incorporates standard holographic techniques and time domain statistical averaging of survey data. Some pertinent characteristics of atmospheric turbulence were reviewed, and the restrictions imposed on standard surveying practices by such turbulence are identified. A model for the turbulent medium is proposed and several theoretical results summarized and extended. Dissert. Abstr.

N82-12418 California Univ., Santa Barbara.
DEVELOPMENT AND APPLICATIONS OF COMPUTER-ASSISTED ACOUSTIC HOLOGRAPHY Ph.D. Thesis
Carl Frederick Schueler 1980 160 p
Avail: Univ. Microfilms Order No. 8120752

Holographic underwater imaging with coherent acoustic radiation and a digital computer is described. The development of hardware and software to produce and digitally reconstruct acoustic holograms is discussed. Among several digital techniques to reconstruct acoustic holograms is one known as backward-propagation. This method is described in a way so that its peculiar characteristics can be explained with reference to aliasing and replication of discrete Fourier transforms. One and two-dimensional images are presented. Using the concept of point-image size, the resolution of the coherent experimental system used to obtain these results is found to be about 1.5 times the diffraction-limited resolution value. Furthermore, the diffraction-limited system resolution matches the Rayleigh resolution criterion that is usually used to evaluate incoherent imaging systems. Dissert. Abstr.

N82-12419*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A RADIONUCLIDE COUNTING TECHNIQUE FOR MEASURING WIND VELOCITY
Jag J. Singh, G. S. Khandelwal (Old Dominion Univ.), and Gerald H. Mall (Computer Sciences Corp., Hampton, Va.) Dec. 1981 25 p refs
(NASA-TM-83202; L-14792) Avail: NTIS HC A02/MF A01 CSCL 14B

A technique for measuring wind velocities of meteorological interest is described. It is based on inverse-square-law variation of the counting rates as the radioactive source-to-counter distance is changed by wind drag on the source ball. Results of a feasibility study using a weak bismuth 207 radiation source and three Geiger-Muller radiation counters are reported. The use of the technique is not restricted to Martian or Mars-like environments. A description of the apparatus, typical results, and frequency response characteristics are included. A discussion of a double-pendulum arrangement is presented. Measurements reported herein indicate that the proposed technique may be suitable for measuring wind speeds up to 100 m/sec, which are either steady or whose rates of fluctuation are less than 1 kHz. N.W.

N82-12420# Naval Research Lab., Washington, D. C. Optical Sciences Div.
PHOTOTHERMAL MEASUREMENT OF OPTICAL SURFACE ABSORPTION USING STRAIN TRANSDUCERS Interim Report
D. H. Leslie and G. L. Trusty 15 Sep. 1981 14 p refs
(AD-A104745; NRL-MR-4575) Avail: NTIS HC A02/MF A01 CSCL 10/2

We discuss the measurement of small optical surface absorption coefficients. A demonstration experiment was performed using a metallurgical strain gauge to measure 488 nm absorption on the surface of a glass plate. A strain of 10 to the minus 8th power resulted from absorption of 0.3 watts. The results are interpreted and the sensitivity of a proposed fiber optic strain gauge is discussed. GRA

N82-12421# Spectrack Systems Div., Cypress, Calif.
CABLE-LENGTH-MEASUREMENT SYSTEM Final Report
30 Apr. 1981 50 p
(Contract W-7405-eng-48)
(DE81-030015; UCRL-15355-Add) Avail: NTIS HC A03/MF A01

The system utilizes the CHIRP technique to measure accurately the static cable length, and the Doppler effect to measure the dynamic rate of change of cable length as it is burned away during tests. Results of this study show that both techniques work well when operated one at a time, but when both CHIRP and Doppler channels are operated simultaneously, interference is produced. DOE

N82-12422# Bendix Corp., Kansas City, Mo.
AUTOMATION OF A SPECIMEN STAGE IN AN ELECTRON MICROPHOBE Final Report
T. E. Pedersen Sep. 1981 17 p refs
(Contract DE-AC04-76DP-00613)
(DE81-030691; BDX-613-2668) Avail: NTIS HC A02/MF A01

The specimen stage of the electron microprobe at Bendix Kansas City was automated. Hardware was constructed to match stepping motors to the stage axis drives; axis drive mechanisms were overhauled; and spatial resolution on each axis was determined. DOE

N82-12423# Stanford Linear Accelerator Center, Calif.
COORDINATE MEASUREMENT BY CURRENT DIVISION: A SIMPLE SYSTEM FOR MULTICHANNEL DETECTORS
B. Gottschalk Aug. 1981 33 p ref
(Contract DE-AC03-76SF-00515; Grant NSF PHY-79-20821)
(DE81-030176; SLAC-TN-81-6) Avail: NTIS HC A03/MF A01

A current division scheme is described based on an unorthodox connection of the 733 amplifier chip: a common-base input can be obtained by grounding the normal inputs and driving a gain control terminal. With ganged multiwire chambers detecting cosmic rays in the proportional region, under realistic operating conditions (charge approx. 2 picocoulombs per gap), the resolution is about 2% of full length. Calibration procedures are discussed, as are the effects of changing various parameters. DOE

N82-12424# Unitex Corp., Salt Lake City, Utah.
HIGH-TEMPERATURE COUNTER-FLOW RECUPERATOR Final Report
F. Rudloff May 1981 324 p refs
(Contract DE-AC07-80ID-12077)
(DE81-031923; DOE/CS-12077/T1) Avail: NTIS HC A14/MF A01

The commercial potential of a helical recuperator design in recovering waste heat from industrial furnaces is reported. The helical recuperator concept consists of a cylindrical column with an interior helical interface which separates the preheat air and the combustion gas. The column operates in a teer flow mode and is formed from modular sections. The material evaluation consisted of exposing material samples to a soda-lime glass furnace environment for a fifteen week period. ECP-3, X-81,

and Unichrome were the best suited for use in a soda-lime environment and ECP-3 was the best candidate with respect to manufacturing. Two potential design modifications were identified: a finned design and a double helix design. For materials that showed the greatest potential for use in the glass environment, the double helix design made from ECP-3 was the most economical producing payback periods of 6 to 14 years. DOE

N82-12425# Los Alamos Scientific Lab., N. Mex.
USER'S GUIDE TO THE HYDROGEN MONITOR
M. M. Meir (NBS, Washington, D.C.) and E. L. Adams Aug. 1981 22 p refs
(Contract W-7405-eng-36)
(DE81-032023; LA-8957-MS) Avail: NTIS HC A02/MF A01

A protocol for calibration of the hydrogen monitor and for its use as an assay instrument is presented. A statistical analysis for the system, including effects of deadtime and pile-up loss, is developed, and the software that supports the system is described. DOE

N82-12426# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
INTEGRATED HUMIDITY SENSOR Final Report
Heinz Hebbeker, Johann Kammermaier, Rudolf Knauer, Franz Lindl, Winfried Peters, Joachim Rauhut, and Rudolf Theuerl Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-007; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

A compact humidity sensor with a capacitive sensor element and processing electronics, for measuring the relative humidity of air, was developed. By a systematic selection of materials for dielectrics and electrodes, signals with linear dependence on moisture and only small changes with temperature were obtained. The electronic circuits are based on pulse length modulation and are designed for digital display. Two alternatives were developed. The circuits with bipolar IC's were specially laid out with 20 mA output, while the CMOS circuits were designed to save energy. In both cases the output signals are evaluated by microcomputers. A specially formed case provides mechanical protection for the sensor element and moistureproof encapsulation of the circuits. The modules were developed for one fabrication stage and were given to consumers for testing.
Author (ESA)

N82-12427# Valvo G.m.b.H., Hamburg (West Germany). Produktbereich MOS-ICS.
NEW PHOTOLITHOGRAPHIC METHODS: PROJECTION ALIGNMENT FOR THE METALLIZATION OF HIGHLY INTEGRATED CIRCUITS Final Report
Ulrich Koenig, Hans-Peter Eggers, Walter Demmer, and Wolfgang Zetmann Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 75 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-018; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

A multilayer metallization interconnection system with a layer sequence of Pt Si-CO-SiO2-Ti-Pt-An was developed. The high quality of the metallization system is documented by life test results. The performance of the complete technology is shown by the realization of an IEZL design with a high packing density. The system is suitable for bipolar integrated circuits, but due to high costs it is only meaningful in cases with high metallization requirements. The projection alignment system, appropriate to a production process and with optical and technological performances suitable for a double layer interconnection, was tested.
Author (ESA)

N82-12428# Valvo G.m.b.H., Hamburg (West Germany). Roehren- und Halbleiterwerke.
NEW PHOTOLITHOGRAPHIC METHOD FOR SMALL DIMENSION. DIRECT STEP AND REPEAT TECHNIQUE (SILICON REPEATER) Final Report
Heino Fehling Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-019; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,60

The direct step and repeat technique was investigated with a silicon repeater, designed for mask as well as slice illumination. The testing of this machine in connection with slice technology is emphasized, especially as to the automatic alignment system. The excellent optical performance and the high positioning and alignment accuracy were demonstrated with different semiconductor technologies. The automatic alignment system performs mask to wafer alignments within + or - 01 micron and overlays of different mask levels within + or - 0.25 micron. For the process evaluation, a comparison was made with a projection aligner.
Author (ESA)

N82-12429# Technische Physische Dienst TNO-TH, Delft (Netherlands).
HOLOGRAPHIC STUDY OF IMPACT PHENOMENA
R. L. vanRenese and H. J. Raterink 2 Dec. 1980 34 p refs
(TPD-1980-0-3; TDCK-75067) Avail: NTIS HC A03/MF A01

Impact phenomena of airgun projectiles on ceramic targets are discussed. The difference between the deformation velocities observed in different experiments is studied. While measured values of about 1.6 m/sec are cited, under similar experimental conditions velocities one or two orders of magnitude greater are also found. A model is developed which describes the spatial extension of the double exposure interference pattern as a function of the parameters deformation velocity, radial velocity of the deformation wave, pulse duration, whole body motion and time. Nonlinear relations for the deformation velocity, and the radial velocity, as a function of time are considered in order to bring the computed results into better agreement with the observed phenomena. As the interference patterns observed appear to be very finely detailed, an alternative holographic setup is described, yielding holograms that can be microscopically evaluated.
Author (ESA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-12430 Cornell Univ., Ithaca, N. Y.
INTENSE PROTON BEAM EXCITATION OF A HIGH PRESSURE ARGON-NITROGEN LASER Ph.D. Thesis
Larry Glenn Wiley 1981 321 p
Avail: Univ. Microfilms Order No. 8119479

An intense proton-beam diode source was developed and beam transport was studied. The magnetically insulated diode produced a uniform planar proton beam having a half-angle divergence less than 4 deg. Beam transport studies included vacuum propagation with and without magnetic focusing fields. Also, spatial bunching of the proton beam during propagation was obtained by using a variable impedance pulse forming line to produce a rapidly rising accelerating voltage pulse. The 0.5 MeV proton beam extracted from the diode source was injected into a high pressure laser cavity through a 2 micron thick mylar foil window. The protons deposited about 0.18 MeV of their energy in the foil and the remainder within a short range (0.15 to 1.2 cm) in the 300-3040 Torr Ar/N2 gas mixture. Ionization and excitation of the gases by the proton beam led to selective excitation of the upper laser level and to subsequent laser action at wavelength of 337.1, 357.7, and 380.5 nm corresponding to electronic transitions to the lower laser levels, respectively. Results from the experimental study of the laser energy, power, and spectral emission were compared to the predictions of a zero dimensional, uniform-gain model of the laser which was solved numerically. Dissert. Abstr.

N82-12431*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXCESS NOISE IN TUNABLE DIODE LASERS
Carroll W. Rowland Nov. 1981 16 p refs
(NASA-TP-1935; L-14453) Avail: NTIS HC A02/MF A01

CSCL 20E

The method and the apparatus for identifying excess-noise regions in tunable diode lasers are described. These diode lasers exhibit regions of excess noise as their wavelength is tuned. If a tunable diode laser is to be used as a local oscillator in a superheterodyne optical receiver, these excess-noise regions severely degrade the performance of the receiver. Measurement results for several tunable diode lasers are given. These results indicate that excess noise is not necessarily associated with a particular wavelength, and that it is possible to select temperature and injection current such that the most ideal performance is achieved.Author

N82-12432# Naval Research Lab., Washington, D. C.
A NEW POWER METER CONCEPT FOR HIGH ENERGY LASERS Interim Report
P. B. Ulrich, G. L. Trusty, and D. H. Leslie 24 Sep. 1981 15 p refs
(AD-A104824; NRL-MR-4429) Avail: NTIS HC A02/MF A01 CSCL 20/5

We describe a new concept for measurement of High Energy Laser (HEL) power. The technique is based upon the phenomenon of optoacoustic detection, which is a sensitive measurement of the sound waves created by absorption of a laser beam of known power with a sample of absorber material for the purpose of absorption coefficient determination. We propose that this process can be inverted to produce an absolute measurement of laser power by using a material for which the absorption coefficient at the laser frequency is sufficiently well known. We present a conceptual design and we suggest studies for future development of the concept. Author (GRA)

N82-12433# Naval Research Lab., Washington, D. C.
THE RAYLEIGH-TAYLOR AND KELVIN-HELMHOLTZ INSTABILITIES IN TARGETS ACCELERATED BY LASER ABLATION Interim Report
M. H. Emery, J. H. Gardner, and J. P. Boris 25 Sep. 1981 20 p refs
(AD-A104804; NRL-MR-4626) Avail: NTIS HC A02/MF A01 CSCL 20/5

Using the FAST2D laser-shell simulation model we have accelerated a 20 micrometer thick plastic foil up to 160 km/s. The foil maintained its integrity up to 10 ns giving an aspect ratio of 40. We are able to follow the Rayleigh-Taylor bubble-and-spike development far into the nonlinear regime and beyond the point of foil fragmentation. Strong shear flow develops at the interface between the bubble-and-spike which leads to the development of the Kelvin-Helmholtz instability. The K-H instability causes the tips of the spikes to widen and as a result reduce their rate of 'fall'. Author (GRA)

N82-12434# Naval Research Lab., Washington, D. C.
COHERENT AND INCOHERENT RADIATION FROM FREE ELECTRON LASERS WITH AN AXIAL GUIDE FIELD Interim Report
H. P. Freund, P. Sprangle, D. Dillenburg, E. H. daJornada, B. Liberman, and R. S. Schneider 8 Oct. 1981 54 p refs
(WF32389592)
(AD-A104806; NRL-MR-4643) Avail: NTIS HC A04/MF A01 CSCL 20/5

The spontaneous and induced emission from a free electron laser is treated for the case in which an axial magnetic field is imposed in addition to the helical, axially periodic wiggler magnetic field. The classes of possible single-particle trajectories in this configuration are discussed, and the results are applied to a calculation of the incoherent radiation from a beam of relativistic electrons in the system. The coherent radiation is treated by solving the Vlasov-Maxwell equations for the linear gain in the tenuous beam limit, where the beam plasma frequency is much less than the radiation frequency and self-field effects can be ignored. Author (GRA)

N82-12435# University of Southern California, Los Angeles. Electronic Sciences Lab.
STUDIES OF OPTICAL-BEAM PHASE-CONJUGATION BY NONLINEAR REFRACTION Interim Scientific Report, 1 Dec. 1979 - 30 Nov. 1980
R. W. Hellwarth 30 Jan. 1981 41 p refs
(Contract AF-AFOSR-3479-78; Grant NSF ENG-78-04774; AF Proj. 2301)
(AD-A105066; AFOSR-81-0643TR; ISR-3) Avail: NTIS HC A03/MF A01 CSCL 20/5

We demonstrated the first cw phase-conjugating mirror with gain, and made a self-oscillating resonator which emitted a diffraction-limited optical beam while severe phase aberration was present in the resonator. We demonstrated storable and erasable phase-conjugate images in the nanosecond regime by a one-photon photorefractive process. We achieved the first demonstration of a wide angle (approx. 45 deg.) narrowband (approx. 1/10 cm) optical filter using phase conjugation. We achieved the first demonstration of full vector-wave phase-conjugation by which an image was restored after double-passing a birefringent phase aberrator. We demonstrated edge-enhancement of an optical phase-conjugate image in real time. Studies of resonant nonlinear refraction and phase conjugation in sodium vapor continued. Author (GRA)

N82-12436# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
SCALING LAWS FOR PULSED CHAIN-REACTION CHEMICAL LASERS
Harold Mirels, Robert Hofland, Jr., and James S. Whittier 7 Aug. 1981 42 p refs
(Contract F04701-80-C-0081)
(AD-A104752; TR-0081(6725)-1; SD-TR-81-57) Avail: NTIS HC A03/MF A01 CSCL 20/5

Scaling laws for pulsed chain-reaction chemical lasers are deduced with the use of a two-level vibrational model. The performance of a saturated laser depends only on the parameter K = t sub cd/t sub p, where t sub cd and t sub p are the characteristic collisional deactivation and characteristic pumping times, respectively. The normalized output energy per unit volume per pulse of a saturated HF chain-reaction laser is 2E/Epsilon H sub 2,0 = K(1 + 0(K)), where E is output energy per unit volume per pulse, Epsilon is energy per mole of photons, and H sub 2, 0 is the initial concentration of H sub 2 in moles per unit volume. In the range 0.02 < or = thi << 1 the normalized output energy from a saturated HF laser can be expressed as 2E/Epsilon H sub 2, 0 = thi, where thi approx. = (F/F sub 2) sub 0 1/2(F sub 2/H sub 2)0(1 + 0.094(F sub 2/H sub 2) sub 0) to the minus 1/2 power. In the latter regime the product Et sub e is a constant for a saturated laser (t sub e = pulse length). Corrections for multiple vibrational levels are given in an Appendix. Author (GRA)

N82-12437# Sandia Labs., Albuquerque, N. Mex. Laser Technology Div.
LASER SYSTEMS FOR THE COMBUSTION RESEARCH FACILITY: ORION
P. J. Brannon, F. R. Franklin, and E. D. Jones Jul. 1981 33 p refs
(Contract DE-AC04-76DP-00789)
(DE81-030989; SAND-81-1598) Avail: NTIS HC A03/MF A01

A frequency doubled Nd:YAG/Glass laser system was constructed to make single shot spontaneous Raman spectroscopy measurements of ongoing combustion processes. The output of the system is 5 J of 1.064 micron radiaton and 0.8 J or 532 nm radiation in a 2 micron sec pulse. The repetition rate of the system is 1 pps. A microprocessor based diagnostic and control system for the operation is described. DOE

N82-12438# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
CONSTRUCTION AND CHARACTERISTICS OF AN OPTICALLY PUMPED FIR-LMR SPECTROMETER [AUFBAU UND EIGENSCHAFTEN EINES OPTISCH GEPUMPTEN FIR-LMR-SPEKTROMETERS]
A. W. Preuss, F. Temps, and H. G. Wagner Sep. 1980 63 p refs In GERMAN
(MPIS-18/1980; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,45

The principle of the spectrometers, the CO2 and FIR lasers are described in detail. The FIR laser operates at more than 50 lines in the wavelength region from 70 to 743 microns and has an output power of about 0.2 mW. Spectrometer absorption

signals are directly proportional to the concentration of radicals. Due to the large number of detectable particles and its sensitivity, this apparatus enables the direct measurement of the concentration of reagents and reaction products for the determination of the time constants of the reactions of free radicals.

Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-12439 California Univ., Los Angeles.
FRICTION AND WEAR BEHAVIOR OF Ti-6Al-4V AND A Ni BASE ALLOY (HASTELLOY C-276) Ph.D. Thesis
Nam-Soo Kim 1981 181 p
Avail: Univ. Microfilms Order No. 8120989

Some variables for wear and friction were investigated riding Ti-6Al-4V and Hastelloy C-276 with a low carbon steel as a mating material. A ring on ring type of specimen contact rather than a pin on disk type was used. The effect of specimen geometry was investigated when two kinds of specimen contact were arranged. Material properties and specimen geometry were variables for the titanium alloy and steel couple. The specimens of Ti-6Al-4V were heat-treated in different ways. It was found that specimen geometry is an important factor for friction and wear behavior specially when the difference in hardness between two contacting materials is large. Variables of load, speed, and specimen geometry were investigated for the Hastelloy and steel couple. Wear amount increases with increasing load and sliding speed. The average coefficient of friction significantly decreases with increasing the applied load. Dissert. Abstr.

N82-12440 Rensselaer Polytechnic Inst., Troy, N. Y.
THE EFFECT OF A TRANSLATING HIGH ASPECT RATIO PARTICLE IN A PLANE SLIDER BEARING Ph.D. Thesis
Michael Thomas Languirand 1981 127 p
Avail: Univ. Microfilms Order No. 8121153

An approximate solution of Stokes equations to determine the pressure and velocity fields in an infinite slider bearing containing a two dimensional high aspect ratio particle of arbitrary cross sectional shape is presented. The fluid field is divided into four regions; upstream, above, below and downstream of the particle. The Stokes equations are applied to each region and solved through specific continuity requirements and pressure matching conditions. Approximate solutions are given for the pressure and velocity fields. A pressure drop which develops in the pressure field at the particle location is noted. The magnitude of this drop is dependent on particle size, velocity and location. The particle has a major effect on the bearing pressure field when it is able to significantly obstruct the flow of the lubricant. The transient pressure in a slider bearing as a high aspect ratio two dimensional rectangular particle is passed through the fluid film. The apparatus measures pressure at a particular location in the bearing and simultaneously measures the particle's displacement with respect to its initial starting location. The effect of particle velocity on the pressure field in the bearing is demonstrated. Dissert. Abstr.

N82-12441* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LIQUID IMMERSION APPARATUS FOR MINUTE ARTICLES Patent
Jewell G. Belcher, Jr. and Ben R. Hollis, Jr., inventors (to NASA) Issued 1 Sep. 1981 4 p filed 18 Jul. 1980 Supersedes N80-32585 (18 - 23, p 3121)
(NASA-Case-MFS-25363-1; US-Patent-4,286,542; US-Patent-Appl-SN-171933; US-Patent-Class-118-423; US-Patent-Class-118-500; US-Patent-Class-134-137) Avail: US Patent and Trademark Office CSCL 13D

Apparatus is disclosed for immersing minute integrated circuit chips in an etching solution in manufacturing integrated circuits during research and development. The apparatus includes a holder, having a handle and basket support for carrying a removable unitary basket and lid structure where fluid flow-through passages are formed, and wherein graduated openings in the handle provide for adjustably supporting the basket in a breaker at a desired level.

Official Gazette of the U.S. Patent and Trademark Office

N82-12442* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODIFIED FACE SEAL FOR POSITIVE FILM STIFFNESS Patent
Izhak Etsion (Technion - Israel Inst. of Tech.) and Abraham Lipshitz, inventors (to NASA) (Technion - Israel Inst. of Tech.) Issued 29 Sep. 1981 4 p Filed 7 Nov. 1979 Supersedes N80-12414 (18 - 03, p 0334) Sponsored by NASA
(NASA-Case-LEW-12989-1; US-Patent-4,291,887; US-Patent-Appl-SN-092145; US-Patent-Class-277-27; US-Patent-Class-277-40; US-Patent-Class-277-93R) Avail: US Patent and Trademark Office CSCL 11A

The film stiffness of a face seal is improved without increasing the sealing and dam area by using an apparatus which includes a primary seal ring in the form of a nose piece. A spring forces a sealing surface on the seal ring into sealing contact with a seat to form a face seal. A circumferential clearance seal is formed in series with this face seal by a lip on the piece. The width of the surface of the lip is subsntially the same as the width of the sealing surface on the face seal and the clearance between the surface on the lip and the shaft is substantially the same as the spacing between the face sealing surfaces on the face seal when the shaft is rotating. The circumferential clearance seal restricts the flow of fluid from a main cavity to an intermediate cavity with a resulting pressure drop. The hydrostatic opening face is strongly dependent on the face seal clearance, and the desired axial stiffness is achieved.

Official Gazette of the U.S. Patent and Trademark Office

N82-12443# National Aerospace Lab., Tokyo (Japan).
STUDY AND DEVELOPMENT OF FACE-CONTACT, BELLOWS MECHANICAL SEAL FOR LIQUID HYDROGEN TURBOPUMP
Masataka Nosaka, Mineo Suzuki, Yukio Miyakawa, Kenjiro Kamijo, Masataka Kikuchi, and Masahiro Mori 1981 38 p refs In JAPANESE; ENGLISH summary
(NAL-TR-653; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A face contact, bellows mechanical seal for a liquid hydrogen turbopump (seal diameter: 43.2 mm) is developed. The developed mechanical seal has a seal nosepiece, which reduces the sealing face distortion at low temperature and high pressure, and results in a small amount of seal leakage and wear and a low starting torque. A vibration damper made of Teflon sheets is fixed in the nosepiece in order to prevent it from fluttering during the rapid start or stop of a turbopump. The turbopump mechanical seal satisfied almost all requirements for application to a turbopump: seal leakage, wear life, reliability and starting torque. S.L.

N82-12444*# Chrysler Corp., Detroit, Mich.
AGT-102 AUTOMOTIVE GAS TURBINE Summary Report
Jun. 1981 434 p refs Sponsored by NASA. Lewis Research Center Prepared jointly with Williams Research Corp., Walled Lake, Mich.
(Contract DE-AC02-76CS-52749)
(NASA-CR-165353; DOE/NASA/2749-81/1) Avail: NTIS HC A19/MF A01 CSCL 13I

Development of a gas turbine powertrain with a 30% fuel economy improvement over a comparable S1 reciprocating engine, operation within 0.41 HC, 3.4 CO, and 0.40 NOx grams per mile emissions levels, and ability to use a variety of alternate fuels is summarized. The powertrain concept consists of a single-shaft engine with a ceramic inner shell for containment of hot gasses and support of twin regenerators. It uses a fixed-geometry, lean, premixed, prevaporized combustor, and a ceramic radial turbine rotor supported by an air-lubricated journal bearing. The engine is coupled to the vehicle through a widerange continuously variable transmission, which utilizes gearing and a variable-ratio metal compression belt. A response assist flywheel is used to achieve acceptable levels of engine response. The package offers a 100 lb weight advantage in a Chrysler K Car front-wheel-drive installation. Initial layout studies, preliminary transient thermal analysis, ceramic inner housing structural

analysis, and detailed performance analysis were carried out for the basic engine. S.L.

N82-12445*# Bales-McCoin Tractionmatic, Inc., El Paso, Tex.
DESIGN STUDY OF A CONTINUOUSLY VARIABLE ROLLER CONE TRACTION CVT FOR ELECTRIC VEHICLES Final Report
Dan K. McCoin and R. D. Walker Sep. 1980 197 p refs
(Contract DEN3-115; EC-77-A-31-1044)
(NASA-CR-159841; DOE/NASA/0115-80/1;
Bales-McCoin-80-BMT-002) Avail: NTIS HC A09/MF A01 CSCL 13I

Continuously variable ratio transmissions (CVT) featuring cone and roller traction elements and computerized controls are studied. The CVT meets or exceeds all requirements set forth in the design criteria. Further, a scalability analysis indicates the basic concept is applicable to lower and higher power units, with upward scaling for increased power being more readily accomplished. S.L.

N82-12446*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWe POWER PLANT. DESIGN REQUIREMENTS DOCUMENT (DRD) Final Report
H. S. Rigo, R. W. Bercaw, J. A. Burkhart, T. S. Mroz, D. J. Bents, and A. M. Hatch (MIT) Sep. 1981 88 p refs Revised
(Contract DE-AI01-77ET-10769)
(NASA-TM-82705; DOE/NASA/10769-20-Rev-3) Avail: NTIS HC A05/MF A01 CSCL 10B

A description and the design requirements for the 200 MWe (nominal) net output MHD Engineering Test Facility (ETF) Conceptual Design, are presented. Performance requirements for the plant are identified and process conditions are indicated at interface stations between the major systems comprising the plant. Also included are the description, functions, interfaces and requirements for each of these major systems. The lastest information (1980-1981) from the MHD technology program are integrated with elements of a conventional steam electric power generating plant. M.D.K.

N82-12447*# EG & G Washington Analytical Services Center, Inc., Riverdale, Md.
IONOSPHERIC PROPAGATION CORRECTION MODELING FOR SATELLITE ALTIMETERS
George Nesterczuk Nov. 1981 14 p refs
(Contract NAS6-3075)
(NASA-CR-156881) Avail: NTIS HC A02/MF A01 CSCL 20D

The theoretical basis and avaliable accuracy verifications were reviewed and compared for ionospheric correction procedures based on a global ionsopheric model driven by solar flux, and a technique in which measured electron content (using Faraday rotation measurements) for one path is mapped into corrections for a hemisphere. For these two techniques, RMS errors for correcting satellite altimeters data (at 14 GHz) are estimated to be 12 cm and 3 cm, respectively. On the basis of global accuracy and reliability after implementation, the solar flux model is recommended. Author

N82-12448# Naval Ocean Systems Center, San Diego, Calif.
***PORTABLE AIR DRIVEN VARIABLE SPEED FIBER OPTIC CABLE TERMINATION POLISHER* Technical Report, Mar. 1979 - Aug. 1980**
A. Flores 15 Mar. 1981 46 p *refs*
(AD-A104797; NOSC/TR-708) Avail: NTIS HC A03/MF A01 CSCL 13/8

Manufacturing processes and techniques were developed to produce in larger volume a portable air driven variable speed fiber optic cable polisher with the necessary characteristics to perform in the operational environments encountered during installation and maintenance of fiber optic cables in military aircraft. Author (GRA)

N82-12449# *Alpha Glass, Inc., El Segundo, Calif.*
CUTTING TOOL COATINGS PROGRAM Final Report
Nov. 1980 47 p
(Contract DE-AC03-80CS-40446)
(DE81-026289; DOE/CS-40446/T1) Avail: NTIS HC A03/MF A01

This project was designed to validate the energy saving potential of hard refractory coatings on cutting tools. One-quarter-inch jobber drills were selected to be coated with the hard refractory compounds of TiC and TiN by the Activated Reactive Evaporation (ARE) process. The TiN-coated drills performed best with tool lives from 2 to 4 times those of the black oxide coated drills, and up to 20 times those of bright drills. This improvement in tool life can be correlated to energy savings as expressed by the criteria of Btu/lb of material removed. Limited direct force measurements were also taken and indicated a reduction in cutting forces of TiN-coated drills over black-oxide-coated drills. A commercial ARE coating system was concieved and analyzed; it was found to be a potentially economica solution to coating a large variety of tools. If coated tools from such a system were fully used in industry, an estimated energy savings of 10 to the 13th power 10 to the 14th power Btu/y could be achieved. This report describes the cutting tool program background work, the project tasks, and the results of the project. DOE

N82-12450# Westinghouse Electric Corp., Pittsburgh, Pa.
STEAM TURBINE BLADES: CONSIDERATIONS IN DESIGN AND A SURVEY OF BLADE FAILURES
R. C. Bates, F. J. Heymann, V. P. Swaminathan, and J. W. Cunningham Aug. 1981 127 p refs Sponsored by EPRI
(EPRI Proj. 912-1)
(DE81-904249; EPRI-CS-1967) Avail: NTIS HC A07/MF A01

Thermo-mechanical considerations and material selection criteria for the design of steam turbine blades are discussed from the mechanical engineer's point of view. Sources of vibratory excitation, responses to excitations, stress levels, resultant load histories, and various design features incorporated to minimize or resist stresses are covered. Blading alloy properties are discussed and compared, and parameters for fatigue testing are recommended. Several blade failure surveys are described. Results of a questionnaire on LP blade failures to American utilities and a review of recent Westinghouse experience are presented. Correlations between the number of failures and parameters such as blade life, failure locations, alloy, deposit chemistry, steam source, feedwater treatment, cooling water source, balance of plant problems, and temperature and pressure at the failed row are attempted. DOE

N82-12451# Mechanical Technology, Inc., Latham, N. Y.
ASSESSMENT OF ROTOR-BEARING DYNAMICS: A PLANNING STUDY FOR THE UTILITY INDUSTRY Summary Report
J. A. Tecza and E. S. Zorzi Electric Power Research Inst. Aug. 1981 22 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 1648-2)
(DE81-904242; EPRI-CS-1990-SY) Avail: NTIS HC A02/MF A01

This summary report presents results, recommendations, and conclusions drawn from a program effort to determine the current state of the art of rotor and bearing dynamic analyses of large steam turbine generators. The conclusions are grouped into three main areas of rotordynamic analysis, bearings, and condition monitoring. Budgetary estimates and program schedules are included. DOE

N82-12452# *United Technologies Corp., South Windsor, Conn. Power Systems Div.*
ADVANCED COOLING FULL-SCALE ENGINE DEMONSTRA-*TION* *Final Report*
Jul. 1981 215 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1319-3)
(DE81-904253; EPRI-AP-1934) Avail: NTIS HC A10/MF A01

The advantages of advanced fabrication techniques for convectively cooled airfoils for utility combustion turbines were discussed with emphasis on airfoils fabricated from thin sheets of metal (water airfoil). It is demonstrated that low metal temperatures could be achieved, corrosion, erosion and deposition problems could be relieved, and economic benefits realized.

Results show that wafer airfoils could be fabricated in utility combustion turbine sizes. Low metal temperatures were achieved in a conceptual design, but experimental verification was not obtained. Tests to show that corrosion, erosion, and deposition problems were relieved. There are economic benefits for wafer airfoils relative to conventionally cast airfoils. Benefits are not large relative to benefits achievable by another fabrication technique, the bonded airfoil, which has a higher degree of development and manufacturing capability. DOE

N82-12453# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.

FEASIBILITY STUDY ON THE FABRICATION OF LONGITUDINALLY WELDED HEAT EXCHANGER TUBES FOR SEA WATER DESALINATION PLANTS ON A FACTORY SHIP Final Report

Juergen Burggraf, Reiner Theobald, and Guenter Tietjen Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 104 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-M-80-004; Rept-54/1980; ISSN-0340-8868;) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,90

These tubes offer advantages over seamless ones and make possible long tube evaporators elaborating a rough production layout estimating the weight as well as the space and drive power required. The necessary ship unit was designed, evaluating investment and operation costs. The technical feasibility of the construction of a factory ship for welded tubes appears realistic. However, corresponding tubes must first be tested on an industrial scale. Author (ESA)

N82-12454# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.

THE RELATION BETWEEN WELDING PARAMETERS FOR A BEAM SECTION AND ITS BUCKLING RESISTANCE [RELATION ENTRE LES PARAMETRES DE SOUDAGE D'UNE COLONNE ET SA CHARGE DE FLAMBEMENT]

A. Plumier Apr. 1981 43 p refs In FRENCH; ENGLISH summary Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture

(CRIF-MT-143) Avail: NTIS HC A03/MF A01

Standardized curves for the calculation of buckling strength are called into question. These curves pertain to different structural members, such as beams and plates. It is demonstrated that for certain fabrication conditions, i.e., manual welding, particularly of I beams, these dimensioning curves give unreliable specifications. The analytical determination of the residual stress distribution in a welded I beam is considered. The evolution of the stress field in a plate being welded is described. Both thin and thick welded plates are dealt with. The method is applied to arrive at parametrical results for the buckling strength of welded sections, allowing the real safety factor to be determined for the defined distribution of welding parameters and cross sections. Complete relations for the calculation of residual stress in various structural profiles are shown. Author (ESA)

N82-12455# Centre Technique des Industries Mecaniques, St. Etienne (France).

STUDY OF FOAMING CHARACTERISTICS AND FOAMING *UNDER PRESSURE: DEAERATING LUBRICANTS AND THE* INFLUENCE OF ANTIFOAMING ADDITIVES [ETUDE DES CARACTERISTISQUES DE MOUSSAGE ET DE MOUSSAGE SOUS PRESSION - DESAERATION DES LUBRIFIANTS - INFLUENCE DES ADDITIFS ANTI-MOUSSE]

J. F. Maurel Dec. 1980 29 p In FRENCH Supersedes CETIM-1.2E.12.0

(CETIM-1.2E.12.3-Pt-5; CETIM-1.2E.12.0) Avail: NTIS HC A03/MF A01

The characteristics of foaming under pressure and their relevance to deaerating oil lubricants are discussed. Laboratory tests are described. The type of oil, test temperature, and the type of antifoaming additive were controlled. Results center on the concentration of antifoaming additive needed in order to assure only an acceptable amount of foaming. Foaming under pressure and deaerating can influence the effectiveness of an air/oil separator filter like those used in oil injection cooled reciprocating compressors. Author (ESA)

N82-12456# Centre Technique des Industries Mecaniques, Senlis (France).

LUBRICATION DURING DRAWING: BIBLIOGRAPHICAL ANALYSIS AND RESULTS, VOLUME 1 Final Report [LUBRIFICATION EN EMBOUTISSAGE. ANALYSE BIBLIOGRAPHIQUE, RESULTATS CETIM. TOME 1]

A. Ferron, R. Lombry, and R. Martin Sep. 1980 163 p refs In FRENCH

(CETIM-13-Y-152-Vol-1) Avail: NTIS HC A08/MF A01

Different lubricants used industrially in metal forming processes were characterized. Analysis results provide a rationale for the choice of lubricant. Friction and wear phenomena are reviewed. Lubrication, either as a thick film or thin film, is explained and criteria for classifying lubricants are established. Industrial objectives specific to deep drawing of mild steel, stainless steel, and aluminum are defined and related to different lubricants available, i.e., oils, aqueous emulsions, chemical solutions, and solid lubricants. The experimental analysis, using an industrial press, is outlined. Author (ESA)

N82-12457# Centre Technique des Industries Mecaniques, Senlis (France).

A HIGH PRESSURE HYDRAULIC PUMP: GHP 1000 DESCRIPTION Final Report [GROUPE HYDRAULIQUE HAUTE PRESSION GHP 1000 - DESCRIPTIF]

J. Lallement 11 Jan. 1981 10 p In FRENCH

(CETIM-5.42.24.0) Avail: NTIS HC A02/MF A01

A hydraulic pumping system is depicted. The main units (feed, return circuit, high pressure pump) are characterized. Operating data are discussed. The hydraulic fluid, pump operating life, system capacity, and operating safety systems are determined. Author (ESA)

N82-12458# National Centre of Tribology, Risley (England).

BALL BEARING EVALUATION FOR A HIGH PRECISION RADIOMETER MIRROR DRIVE

M. J. Todd and A. J. Walton Paris ESA May 1981 52 p refs

(Contract ESA-4012/79/NL-PP)

(ESA-(ESTL)47; ESA-CR(P)-1461) Avail: NTIS HC A04/MF A01

Rolling element bearings are considered for use with a rotating scanning mirror requiring extremely high pointing accuracy and low jitter on the rotational speed. The mirror is used in the ocean color monitor of COMSS. A theoretical assessment of possible bearing systems was made. Radial stiffness was measured and run out on ultra high precision shafts and bearings was performed to determine actual rotational speed variations. Results indicate that commercial ball bearings can be selected to meet the pointing system requirements. Author (ESA)

N82-12459# Lucas Aerospace Ltd., Hemel Hempstead (England).

COMPRESSION STRESS RELAXATION TESTING FOR DETERMINING THE PERFORMANCE OF ELASTOMERIC FLUID SHELLS

M. W. Aston, K. P. Palmer, and J. Bayley 1981 17 p refs Avail: NTIS HC A02/MF A01

The compression stress relaxation properties of fluorocarbon and fluorosilicone 'O' rings are correlated to their sealing performance and related to other properties which are commonly used for assessing this performance. Correlation with sealing performance is good. Poor correlation is obtained with volume swell, compression set, low temperature brittle point and the Gehman T10 value. These properties could give a misleading indication of the likely sealing performance of the elastomer. Compression stress relaxation is the property which most closely conforms to the configuration in which most elastomeric seals are used and is the best property for indicating their likely sealing performance, particularly as it can be measured over the full range of environmental conditions that might be applied to the seal. Author (ESA)

N82-12117*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

TRIBOLOGY EXPERIMENT

William A. Wall *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 58-60 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 20K

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-12460# Centre Technique des Industries Mecaniques, St. Etienne (France).
FACING ON STAMPING DIES Final Report [REVETEMENT DES GRAVURES D'ESTAMPAGE]
Batit 15 Dec. 1980 21 p refs In FRENCH
(CETIM-1.3K.26.2) Avail: NTIS HC A02/MF A01

Three surface treatments, commercially available to improve the wear resistance of stamping die matrices, were tested and compared. The surface coatings were applied by the companies marketing the techniques. Testing was carried out in the laboratory under semi-industrial conditions. Results show that: (1) the Rocklin coating, which consists of tungsten carbides and/or titanium carbides, has the same wear characteristics as the unsurfaced test die; (2) electrodeposition of cobalt alloys (still process) improves wear resistance; and (3) boride coating on stamping tool steel is of little benefit since there is not enough difference in fracture strength between the unsurfaced die face and the coating. Author (ESA)

N82-12461# Centre Technique des Industries Mecaniques, St. Etienne (France).
BIBLIOGRAPHICAL STUDY OF NONDESTRUCTIVE TESTING APPLICABLE TO BONDING [ETUDE BIBLIOGRAPHIQUE DES MOYENS DE CONTROLE NON DESTRUCTIF ENVISAGEABLES POUR LES COLLAGES]
Benazet Oct. 1980 37 p refs In FRENCH
(CETIM-1.3N.20.2-Pt-1) Avail: NTIS HC A03/MF A01

The nondestructive characterization of surfaces to be bonded as well as tests which reveal the spreading behavior of glues after bonding are reviewed. No test which can unequivocably determine the suitability of a surface for bonding is found. However, for a given process, i.e., aluminum bonding, measurement of the difference in surface contact potentials gives good results. Among methods for testing the even spreading of glue between bonded surfaces, only ultrasonic techniques are at present economically feasible on an industrial level. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-12462# Polish Academy of Sciences, Warsaw.
SHEAR WAVES IN BUILDINGS SUBJECTS TO SEISMIC LOADING
Wladyslaw Nadolski, Amalia Pielorz, and Zaklad Ukladow Mechanicznych 1981 22 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The displacements of cross sections of columns in a multistorey building were determined with the use of one dimensional elastic waves taking into account reflections. Formulas were developed for accelerations of the building foundation and for equivalent damping of the viscous type. Analytical solutions were obtained in the form of recurrence formulas for the functions, by means of which displacements of the cross sections of the building columns can be determined at any moment of time. The physical model of a multistorey building is examined. A.R.H.

N82-12463# Polish Academy of Sciences, Warsaw. Inst. of Fundamental Technological Research.
THE PROBLEM OF AXIALLY SYMMETRIC FLOW OF IDEAL RIGID-PLASTIC HUBER-MISES MEDIUM WITHOUT ANY SPECIFIC HYPOTHESES
Marian Rogozinski 1981 21 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The general system of seven equations in the problem is reduced to two by means of, among other things, the introduction of two unknowns: alpha and beta. The necessary boundary values for posing the boundary problem in the case of a hyperbolic system are determined. The integrodifferential equation system is reduced to a hyperbolic system in the whole region under consideration by means of a suitable transformaton of alpha, beta, into bar alpha, beta. The method of characteristics is used. In the case of ellipticity, (the main alternative of the hyperbolicity, there is no uniqueness of solution, and some instability would occur because of the unbounded domain. A.R.H.

N82-12464 Iowa State Univ. of Science and Technology, Ames.
THE RESPONSE AND THE LIFT FORCE ANALYSIS OF A CYLINDER OSCILLATING IN STILL WATER Ph.D. Thesis
Youn-sik Park 1981 131 p
Avail: Univ. Microfilms Order No. 8122553

An elastically mounted cylinder exposed to a periodic fluid flow field is studied. The prediction of fluid lift forces and cylinder responses normal to the deterministic, sinusoidal oscillating flow is emphasized. A cylinder model was driven sinusoidally in still fluid in order to give a relative sinusoidal motion between the fluid and cylinder. A simple experimental apparatus and a strict control of the input variables such as cylinder driving amplitude and frequency were selected. The corresponding fluid lift forces and the cylinder response amplitude were measured for two different size cylinder models for various cylinder driving frequencies and amplitudes. It was found that the fluid lift forces and the cylinder response amplitudes for an elastically mounted cylinder can be explained and predicted using frequency ratios rather than Reynolds and the Keulegan-Carpenter numbers. The measured fluid lift forces were found to be far greater than those corresponding to a stationary cylinder exposed to an oscillating flow field. Dissert. Abstr.

N82-12465 Rensselaer Polytechnic Inst., Troy, N. Y.
EMISSION SPECTRA FROM EHD CONTACTS Ph.D. Thesis
Vincent Wen-Shiuan King 1981 134 p
Avail: Univ. Microfilms Order No. 8121150

A ball/plate sliding elastohydrodynamic contact was constructed by placing a diamond window at the bottom of a cup containing test fluid and rotating a loaded bearing ball over it about a horizontal axis. The infrared radiation generated by viscous friction in the lubricant film is transmitted through the window, collected by an all-mirror microscope objective, and analyzed by a Michelson interferometer. It is thus possible not only to determine lubricant and bearing ball surface temperatures but the infrared spectrum of the lubricants as well. The radiation emitted in the contact region is very weak, but the high sensitivity of the interferometer (Fourier spectrometer) is more than adequate to analyze it. The equivalence between infrared emission and absorption spectra was established. Dissert. Abstr.

N82-12466 Polytechnic Inst. of New York, Farmingdale.
VIBRATION OF CYLINDRICAL SHELLS AND PANELS OF OVAL CROSS-SECTION Ph.D. Thesis
Vlasios K. Koumousis 1980 285 p
Avail: Univ. Microfilms Order No. 8118881

The dynamic characteristics of simply supported and infinitely long cylindrical shells of oval cross section are established on the basis of Flugge type, thin shell theory. A method obtaining the dynamic characteristics of cylindrical panels of non circular cross section with simply supported, curved edges and any boundary conditions along their straight edges is presented. Numerical results are presented and the effect of the ovality as well as other geometric parameters of the shell are investigated, and the range of validity of the Donnell and Love type theories is established. The general solution of this system of eight equations is written as a linear combination of a set of eight independent solutions involving eight constants. Numerical

results are obtained on the basis of the Flugge and Donnel type theories for oval panels with different ovality, length, thickness ratio and opening angles of 180 and 120. The influence of the geometric parameters and a comparison of the different theories were studied. Dissert. Abstr.

N82-12467 Washington Univ., Seattle.
WAVE INDUCED VIBRATIONS OF CONTINUOUS FLOATING STRUCTURES Ph.D. Thesis
Constantinos Georgiadis 1981 118 p
Avail: Univ. Microfilms Order No. 8121197

The response of continuous floating structures was studied. Hydrodynamic forces on a continuous floating structure are examined and boundary element methods were used for the numerical solution. Response of a continuous floating structure to long crested, oblique waves are investigted. Fourier transformation techniques and finite element modeling were applied. Errors of a rational finite element model are pointed out. Response of a continuous floating structure to short crested waves the sea is modelled as a random process with a directional energy spectrum. Monte-Carlo and linear filtering methods are used to obtain nodal loads satisfying appropriate space correlation of the waves. Response of floating bridges and breakwaters to boat wakes are also studied. Computer programs are developed to implement and to give a complete design support for the mentioned structures. Dissert. Abstr.

N82-12468 Illinois Univ. at Chicago Circle, Chicago.
PROPERTIES OF CONFINED CONCRETE SUBJECTED TO STATIC AND DYNAMIC LOADS Ph.D. Thesis
Shuaib Haroon Ahmad 1981 397 p
Avail: Univ. Microfilms Order No. 8120556

Accurate and reproducible complete stress-strain curves of unconfined and confined concrete subjected to uniaxial monotonic and cyclic compressive loads are investigated. Prior to systematically obtaining the stress-strain curves, the effect of the testing parameters (method of obtaining the descending portion of the stress-strain curve, effect of size, shape of the specimen, effect of age at testing) and methods of measuring (gage length effects for strain measurements) were also carefully studied. A constitutive law under multiaxial compressive loadings, for predicting the complete (ascending and descending portions) stress-strain curves was developed. A simple experimental technique (concrete confined in steel tube) was developed to obtain the post peak behavior under cylindrical trixial compressive loadings.
Dissert. Abstr.

N82-12469 Washington Univ., Seattle.
A CRITICAL VOID GROWTH FAILURE CRITERION DEVELOPED FOR DYNAMIC AND STATIC LOADING CONDITIONS Ph.D. Thesis
A. M. Rajendran 1981 74 p
Avail: Univ. Microfilms Order No. 8121255

The classical plastic instability which precedes ductile failure is examined under conditions in which inertia terms are significant. When the constitutive laws for incompressible materials are used in the dynamic stability analysis, the results confirm the experimental evidence which indicates that the plastic instability is inhibited by inertia. This analysis however, can not provide an instability criterion capable of predicting failure under dynamic loading. Replacing the incompressible model with one applicable to porous plastic materials, provides an alternative means to predict failure under both static and dynamic loading conditions by the introduction of a failure criterion based on a critical void volume fraction. Encouraging results are obtained when this failure analysis is applied to different experimental conditions in which the failure occurs under either low or high mean stress levels. The results indicate that a material may fail when the void volume fraction reaches a critical level, and that the critical level is not dependent on the type of loading process required to produce this void volume fraction. Dissert. Abstr.

N82-12470 Cornell Univ., Ithaca, N. Y.
THE BEHAVIOR AND STRENGTH OF LAPPED SPLICES IN REINFORCED CONCRETE BEAMS SUBJECTED TO CYCLIC LOADING Ph.D. Thesis
Anthony Daniel Tocci 1981 275 p
Avail: Univ. Microfilms Order No. 8119436

Tensile lap splices in reinforced concrete beams are studied using specimens subjected to repeated and reversed cyclic loading into the inelastic range. The parameters that influence the strength of tensile lap splices are valuated and guidelines for the design of splices to resist seismic loading are developed. Tests on full scale beam specimens which had either two no. 8 or two no. 10 main bars spliced in a region of constant moment or a region of combined moment and shear were conducted. The main variables studied are load history, the amount and distribution of transverse steel and the influence of shear. The number of cycles and maximum strain level in the inelastic range has a greater influence on splice performance than if load reversals are included in the loading sequence. Dissert. Abstr.

N82-12471 State Univ. of New York at Buffalo.
INELASTIC FINITE STRAIN ANALYSIS OF STRUCTURAL METALS SUBJECTED TO NONPROPORTIONAL LOADINGS Ph.D. Thesis
Nien-Tsu Tseng 1981 209 p
Avail: Univ. Microfilms Order No. 8122206

The formulation of material constitutive relationships and solution procedures to deal with inelastic finite strain analysis of structural metals subjected to nonproportional loadings is studied. When metal structures are undergoing strong earthquake ground motions, the loadings are nonproportional in nature and the strains in various locations of the structure should be treated as finite. In order to treat the dependent behavior of materials under nonproportional conditions, a rate independent plasticity model is proposed. Excellent correlation is established between the proposed model and experimental observations on stress relaxation, cyclic creep and other transitory phenomena of strain hardening or strain softening materials subjected to generalized uniaxial cyclic loadings. Dissert. Abstr.

N82-12472*# General Research Corp., Santa Barbara, Calif.
TEST PROGRESS ON THE ELECTROSTATIC MEMBRANE REFLECTOR
D. J. Mihora Hampton, Va. NASA. Langley Research Center 29 Jun. 1981 129 p refs
(Contract NAS1-16133)
(NASA-CR-165792; CR-2-998) Avail: NTIS HC A07/MF A01 CSCL 20K

An extemely lightweight type of precision reflector antenna, being developed for potential deployment from the space shuttle, uses electrostatic forces to tension a thin membrane and form it into a concave reflector surface. The typical shuttle-deployed antenna would have a diameter of 100 meters and an RMS surface smoothness of 10 to 1 mm for operation at 1 to 10 GHz. NASA Langley Research Center built and is currently testing a subscale (16 foot diameter) model of the membrane reflector portion of such an antenna. Preliminary test results and principal factors affecting surface quality are addressed. Factors included are the effect of the perimeter boundary, splicing of the membrane, the long-scale smoothness of commercial membranes, and the spatial controllability of the membrane using voltage adjustments to alter the electrostatic pressure. Only readily available commercial membranes are considered. A.R.H.

N82-12473*# National Aeronautics and Space Administration, Washington, D. C.
THEORY OF THERMOELASTICITY
Dorin Iesan Nov. 1980 414 p refs Transl. into ENGLISH of the book "Teoria Termoelasticitatii" Bucharest, Editura Academiei Republicii Socialiste Romania, 1979 p 1-275 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75510) Avail: NTIS HC A18/MF A01 CSCL 20K

The development of the theory of thermoelasticity, which examines the interactions between the deformation of elastic media and the thermal field, is traced and the fundamental problems of the theory are presented. Results of recent studies on the subject are presented. Emphasis is primarily on media with generalized anisotropy, or isotropy media. Thermomechanical problems and mathematical formulations and resolutions are included. A.R.H.

N82-12474*# National Aeronautics and Space Administration, Washington, D. C.

LAMINATED ANISOTROPIC REINFORCED PLASTIC PLATES AND SHELLS

V. I. Korolev Oct. 1981 241 p refs Transl. into ENGLISH of the book "Sloistyye Anizotropnyye Plastinki i Obolochki iz Armirovannykh Plastmass" Moscow, Mashinostroyeniye Press, 1965 p 1-272 Translation was announced as N75-75901 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76585) Avail: NTIS HC A11/MF A01 CSCL 20K

Basic technical theories and engineering calculation equations for anisotropic plates and shells made of rigid reinforced plastics, mainly laminated fiberglass, are presented and discussed. Solutions are given for many problems of design of structural plates and shells, including curved sections and tanks, as well as two chapters on selection of the optimum materials, are given. Accounting for interlayer shearing and transverse separation, which are new engineering properties, are discussed. Application of the results obtained to thin three ply plates and shells wth a light elastic filler is presented and discussed. Author

N82-12475# Naval Research Lab., Washington, D. C.

THE RESPONSE OF TWO FLUID-COUPLED PLATES TO AN INCIDENT PRESSURE PULSE Progress Report, Nov. 1980 - Mar. 1981

R. S. Schechter and R. L. Bort 12 Oct. 1981 36 p refs (SF43400001)

(AD-A104801; NRL-MR-4647) Avail: NTIS HC A03/MF A01 CSCL 19/4

The response of two plates coupled by an acoustic fluid to an incident pressure pulse is calculated using flat-plate theory. In addition, a similar calculation is done by a different method, where the interior fluid between the plate is modeled as a lumped parameter system of masses and springs. It is shown that as more masses and springs (fluid elements) are used that this solution approaches the continuous fluid solution. The cases where the second plate is backed by water and air are computed using both methods. The lumped-parameter model of the interior fluid is found to degrade the detail of the responses of the plates compared to the continuous-fluid solution, but the general features of the response (timing and magnitude of the peak velocities, for example) are not greatly affected even for relatively crude representations of the fluid, of two to five fluid elements. The calculations are carried out to better understand the interaction of a shockwave from an underwater explosion and the sail appendage of a submarine. Author (GRA)

N82-12476# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Metals and Ceramics Div.

VISCOPLASTIC AND CREEP CRACK GROWTH ANALYSIS BY THE FINITE ELEMENT METHOD Ph.D. Thesis. Final Report, Jul. 1977 - Jun. 1980

Terry D. Hinnerichs Jul. 1981 191 p refs

(AF Proj. 2307)

(AD-A105120; AFWAL-TR-80-4140) Avail: NTIS HC A09/MF A01 CSCL 11/6

Creep crack growth in a nickel base alloy at elevated temperatures was analyzed through a hybrid experimental-numerical (HEN) procedure. This HEN procedure consisted of simultaneous use of creep crack growth test displacement data from center cracked plate specimens of IN-100 at 1350 F and a theoretical finite element model of the test specimen. A two-dimensional (constant strain triangular) finite element program was developed which accounts for both nonlinear viscoplastic material behavior and changing boundary conditions due to crack growth. Three viscoplastic material models -- (1) Malvern Flow Law, (2) Norton's Creep Law, and (3) Bodner-Partom Flow Law -- were incorporated into the program. These time dependent material models were numerically integrated through time by a linear Euler extrapolation technique. A variable time step algorithm was included that maximized time step size during the analysis while maintaining good accuracy. This program was used as the plane stress theoretical model for the HEN procedure to analyze sustained load creep crack growth. A method for getting creep crack growth behavior solely from high resolution displacement measurements, in conjunction with a cracked specimen model which utilizes realistic constitutive relationships, has been developed. GRA

N82-12477# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon System Lab.

ELASTIC-PLASTIC THICK-WALLED TUBES SUBJECTED TO INTERNAL PRESSURE AND TEMPERATURE GRADIENT Final Report

P. C. T. Chen Sep. 1981 24 p refs Presented at the Conf. of Army Mathematicians (27th), West Point, N. Y., 10-12 Jun. 1981

(DA Proj. 1L1-61102-BH-57)

(AD-A105243; ARLCB-TR-81038) Avail: NTIS HC A02/MF A01 CSCL 20/11

Using von Mises' criterion and the Prandtl-Reuss flow theory, numerical solutions are obtained for the stresses, strains, and displacements in an elastic-plastic thick-walled tube subjected to internal pressure and temperature gradient. The material is based on the incremental finite-difference method in conjunction with a scaled loading approach. All incremental quantities are determined in the program and no iteration is needed. The approach is simpler than others yet quite general and accurate. Author (GRA)

N82-12478# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.

ACOUSTIC EMISSION FROM CONCRETE SPECIMENS Final Report, Apr. 1979 - Sep. 1980

P. F. Mlakar, R. E. Walker, and B. R. Sullivan Sep. 1981 39 p refs

(DA Proj. 4A1-61101-A-91D)

(AD-A105416; WES/MP/SL-81-26) Avail: NTIS HC A03/MF A01 CSCL 11/2

Six monotonic and six cyclic load compression tests on 6- by 12-in. cylindrical concrete specimens were monitored for acoustic emission. Fundamental data were collected and analyzed and the Kaiser effect was observed. The data are presented as counts versus events to aid in the identification of source characteristics. One multiaxial load (compression and tension) test was also monitored. The slope of counts versus event curve for this primarily tension test differed from those of the curves for the primarily compression test. This difference suggests that the source characteristics of concrete acoustic emissions can be empirically separated and identified. Author (GRA)

N82-12479# Argonne National Lab., Ill. Applied Mathematics Div.

BUCKLING OF A THIN INITIALLY WRINKLED RECTANGULAR PLATE

Bernard J. Matkowsky (Northwestern Univ.), Leonard J. Putnick (Siena College), and Edward L. Reiss (Northwestern Univ.) Aug. 1981 19 p refs

(Contract W-31-109-eng-38)

(DE81-029963; ANL-81-51) Avail: NTIS HC A02/MF A01

The deformation of a thin elastic plate, which is initially wrinkled, when the plate is subjected to a constant compressive and thrust is considered. It is found that the initial deformation (imperfection) of the plate leads to solutions which explain the experimentally observed decrease in the buckling load from that predicted by bifurcation theory and the smooth transition to a buckled solution. DOE

N82-12480# Sandia Labs., Albuquerque, N. Mex. Mechanical Metallurgy Div.

MECHANICAL PROPERTIES OF A 4142 STEEL PRESSURE VESSEL FOR AUXILIARY CLOSURES

M. S. SooHoo Aug. 1981 29 p refs

(Contract DE-AC04-76DP-00789)

(DE81-030983; SAND-81-0884) Avail: NTIS HC A03/MF A01

Tensile, fracture toughness, and stress corrosion cracking susceptibility measurements were performed on an SISI 4142 seamless steel tubing material. This steel tubing is a candidate pressure vessel material for use in underground door closure systems at Nevada Test Site. Experiments indicate that while the post weld heat treatment produces a uniform weld, the

weld zone is the region most susceptible to stress corrosion cracking from water. DOE

N82-12481# Hanford Engineering Development Lab., Richland, Wash.
MINIATURIZED FATIGUE CRACK GROWTH SPECIMEN TECHNOLOGY AND RESULTS
R. J. Puigh, R. E. Bauer, A. M. Ermi, and B. A. Chin 11 Jun. 1981 16 p refs Presented at the 2nd Topical Meeting on Fusion Reactor Mater., Seattle, 9-12 Aug. 1981
(Contract DE-AC14-76FF-02170)
(DE81-029757; HEDL-SA-2475) Avail: NTIS HC A02/MF A01

The miniature fatigue crack propagation technology was extended to in-cell fabrication of irradiated specimens. Baseline testing of selected titanium alloys was performed at 250 C in air. At relatively small values for the stress intensity factor, (RADICAL)K, the crack growth rates for all titanium alloys investigated are within a factor of three. The crack growth rates for these titanium alloys are a factor of three greater than the crack growth rates of either 316 SS (20% CW) or HT-9. Each of the titanium alloys has observable crack propagation for stress intensity factors as small as 4.2 MPa(INTEGRAL)m. DOE

N82-12482# Brookhaven National Lab., Upton, N. Y. Corrosion Science Group.
FRACTURE MECHANISMS OF SENSITIZED STAINLESS STEELS IN SULFUR-CONTAINING ENVIRONMENTS
R. C. Newman, K. Sieradzki, and H. S. Isaacs 1981 10 p refs Presented at the Intern. Conf. on Environ. Degradation of Eng. Mater., Blacksburg, Va., 21 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE81-026052; BNL-29671; CONF-810913-5) Avail: NTIS HC A02/MF A01

The stress corrosion cracking of sensitized type 304 stainless steel was studied in a 6 x 10 to the minus fourth M sodium thiosulfate solution at room temperature. Under constant extension rate conditions the crack initiation probability is a maximum at -100 mV (SCE) and approaches zero for a smooth surface at > -300 or < +300 mV. Initiated cracks propagate at high rates at potentials as high as +500 mV; a maximum crack velocity of 8 micrometers/sec was measured in a precracked specimen under constant load. Crack initiation probability can be correlated with the repassivation behavior of simulated grain boundary material, but the high crack propagation rates probably require a large contribution from intermittent mechanical grain boundary failure. DOE

N82-12483# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
WORKING STRENGTH OF NOTCHED SPECIMENS IN STEEL Ck45 AND STEEL 42 Cr Mo4 [BETRIEBSFESTIGKEIT VON KERBSTAEBEN AUS STAHL Ck 45 UND STAHL 42 CrMo4]
E. Haibach and C. Matschke 1980 108 p refs In GERMAN; ENGLISH summary
(LBF-FB-155(1980)) Avail: NTIS HC A06/MF A01

The working strength of notched steel specimens was investigated and the test results evaluated in connection with a damage accumulation calculation. The test program comprising 12 series and a total of 199 tests on notched specimens (Kt = 3.6) in steel Ck 45 or steel 42 CrMo 4, were performed by using programmed loading, random loading or a digitally reproduced service load sequence. In addition, 109 constant amplitude test results were considered for reference in an analyzing procedure based on the concept of uniform scatter bands applying to the S-N curves in question. A statistical analysis shows that the experimental scatter bands of the variable amplitude fatigue life curves are closely correlated to the particular scatter bands as computed by a modified version of Miner's rule, but with the experimental mean values being lower by factors of 0.883 to 0.911 in terms of stress. The results are tabulated.Author (ESA)

N82-12484# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
INFLUENCE OF A MULTIAXIAL MEMBRANE STRESS SITUATION ON THE STRESS CONCENTRATION FACTOR, USING THE EXAMPLE OF AN OPEN UNFINISHED DRILLED HOLE [UEBER DEN EINFLUSS EINES MEHRACHSIGEN MEMBRANSPANNUNGSZUSTANDES AUF DEN SPANNUNGSKONZENTRATIONSFAKTOR AM BEISPIEL EINER OFFENEN UNBEARBEITETEN BOHRUNG]
Lueder Schwarmann 12 Nov. 1979 14 p refs In GERMAN (Ek-43-B/251/79) Avail: NTIS HC A02/MF A01

The stress concentration factor alpha C for a plate with limited width W, containing a circular drilled hole (diameter D) is calculated, using the linear elastic theory of elastomechanics. The factor alpha C does not only depend on the geometrical ratio D/W, but also on the applied membrane stresses Tx, Ty, Txy. Compared with one-axial tensile strain (y-direction), additional tensile strains (in the x-direction) cause a reduction of alpha C while an additional compressive strain (in the x-direction) and additional shear strain cause an increase in alpha C. The results are also valid for other groove problems. Author (ESA)

N82-12485# Centre Technique des Industries Mecaniques, Senlis (France).
IN SITU GONIOMETER [GONIOMETRE IN SITU]
B. Miege Nov. 1980 64 p refs In FRENCH
(CETIM-5.41.22.0-Pt-1) Avail: NTIS HC A04/MF A01

A system for stress analysis, based on a linear direction detector, is described. The system allows X-ray diffraction stress measurement on large specimens and under industrial conditions. The goniometer system was characterized for spatial resolution, positioning linearity, sensitivity and energy resolution. Laboratory results are used to develop computer programming for stress analysis. The mechanical support for the goniometer is also presented. Author (ESA)

42 GEOSCIENCES (GENERAL)

N82-12486 Connecticut Univ., Storrs.
A TWO-LAYER GROUND HYDROLOGY MODEL INTERACTIVE WITH AN ATMOSPHERIC CIRCULATION MODEL Ph.D. Thesis
John Joseph Alfano 1981 641 p
Avail: Univ. Microfilms Order No. 8122768

A global ground hydrology model (GHM) consisting of a surface or upper root zone and a lower root zone is developed for use in an atmospheric general ciculation model (GCM) for studying land surface processes. The GCM calculates momentum, moisture, energy and pressure changes in the atmosphere by discretizing the global surface into cells, 4 deg latitude by 5 deg longitude, where the hydrology deg model provides these fluxes at the ground surface. The GHM operates in two modes. The first is a noninteractive mode where the GHM uses a set of prescribed meteorological data and the other is an interactive mode where the GCM and GHM are calculated simultaneously. The noninteractive mode is shown to be an efficient way to prepare and evaluate the GHM before it is used to the GCM. In the noninteractive mode the GHM reads a global data tape furnished from a previously run GCM contaning a standard ground hydrology model which may or may not be the same as the GHM. The GHM is an improvement over the standard hydrology model that exists in the GCM because it furnishes more realistic moisture and heat fluxes needed in calculating the global general ciculation. Dissert. Abstr.

N82-12487# Geological Survey, Washington, D. C.
WORLDWIDE DIRECTORY OF NATIONAL EARTH-SCIENCE AGENCIES AND RELATED INTERNATIONAL ORGANIZATIONS
Wenonah E. Bergquist, comp., Elizabeth J. Tinsley, comp., Laura Yordy, comp., and Ralph L. Miller, comp. 1981 91 p
(USGS-CIRC-834) Avail: NTIS HC A05/MF A01

This edition of the 'Worldwide Directory' was prepared in response to continuing requests for up-to-date information on earth-science organizations. It provides addresses of governmental earth-science agencies around the world that have functions similar to those of one or more of the operating divisions of the U.S. Geological Survey; it also lists addresses of major international organizations that are concerned with some phase of the earth

sciences. The directory is arranged alphabetically by the name of the country. The location of each country is shown on a small index map, which is keyed to one of eight reference maps showing major regions of the world. The index maps should be helpful to the user in identifying countries that have adopted new names or that have recently attained independence. L.F.M.

N82-12488# Delft Hydraulics Lab. (Netherlands).
MODELING AS A TOOL
L. Postma Apr. 1981 14 p refs
(Publ-252; ISSN-0166-7521) Avail: NTIS HC A02/MF A01

The use of mathematical models to investigate problems in aquatic biology is introduced. Rules governing the construction of models are explained, (system identification, calibration, verification). The aims of models, (generation of hypotheses, estimation of parameters, extrapolation, etc.) are considered. Examples of tests of hypotheses, estimation of parameters, and transposition of results are illustrated by considering investigations of the death of the blue green algae anabaena in Lake Brielle, the meaning of light curves for algal succession, and of the succession of phytoplankton and z00 plankton in a reservoir. Models exist which predict the maximum biomass, but models for biomass plus transition states from one maximum to another, or z00 plankton and fish together have to be constructed by physicians, chemists, biologists and mathematicians working together. Author (ESA)

N82-12489# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES, NO. 17
2 Nov. 1981 79 p refs Transl. into ENGLISH from various Russian publications
(JPRS-79342) Copyright. Avail: NTIS HC A05/MF A01

Research in the areas of oceanography, geophysics, atmospheric physics, is reported. Mining experiences in the antactic are included. Specifically, topics include analysis of oceanographic and meteorological data, development of geophysical and atmospheric models, and seismic profiling. For individual title, see N82-12490.

N82-12490# Joint Publications Research Service, Arlington, Va.
HYDROPHYSICAL INSTRUMENTATION AND COMPUTER COMPLEX
Ye. G. Nechesin, A. V. Nikitin, A. N. Paramonov, Ye. I. Timofeyev, and Yu. I. Shapovalov *In its* USSR Rept.: Earth Sci., No. 17 (JPRS-79342) 2 Nov. 1981 p 7-17 refs Transl. into ENGLISH from Upr. Sist. Mash. (Kiev), no. 3, May-Jun. 1981 p 100-106 (For primary document see N82-12489 03-42)
Avail: NTIS HC A05/MF A01

An instrumentation computer complex developed for onboard collection and primary processing of oceanographic data is described. The progressive concept of buswise organization ad modularity of the functional assemblies is the basis for the design of the complex. A block diagram of the complex is given. The submersible measurement system and the onboard data conversion and processing system are described. J.M.S.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-12491 Cornell Univ., Ithaca, N. Y.
REMOTE SENSING STUDIES OF SOME IRONSTONE GRAVELS AND PLINTHITE IN THAILAND Ph.D. Thesis
Pichit Jamnongpipatkul 1980 336 p
Avail: Univ. Microfilms Order No. 8177113

Ironstone gravels and plinthite in eastern Thailand were found to be associated with alluvial terraces as well as shale and basalt formation. Selected stereopairs of airphotos of known areas of ironstone gravels and plinthite were studied. The keys for airphoto interpretation were developed on the basis of the relation with types of landform, vegetation and appearance on the airphotos. Visual analysis of LANDSAT data provided information on the types of LANDSAT and vegetation which could lead to more detailed investigation of probable areas of ironstone gravels and plinthite. Digital analysis of LANDSAT data indicated that the difference of spectral reflectances from areas of ironstone gravels and those from the surrounding areas is considerable. Field study was conducted to verify the results of airphotos interpretation and LANDSAT data analysis and to obtain information in regard to genesis and morphology of soils with ironstone gravels and plinthite. Soil profile descriptions for typical soils with ironstone gravels and plinthite are included.
Dissert. Abstr.

N82-12492*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EXPLORES THE EARTH
Washington 1977 512 p refs Original contains color illustrations
(NASA-SP-380; LC-77-829) Avail: NTIS MF A01; SOD HC $16.50 CSCL 08B

Data from visual observations are integrated with results of analyses of approxmately 600 of the nearly 2000 photographs taken of Earth during the 84-day Skylab 4 mission to provide additional information on (1) Earth features and processes; (2) operational procedures and constraints in observing and photographing the planet; and (3) the use of man in real-time analysis of oceanic and atmospheric phenomena. For individual titles, see N82-12493 through N82-12509.

N82-12493*# Geological Survey, Denver, Colo.
DESERT SAND SEAS
Edwin D. McKee, Carol S. Breed (Geological Survey, Flagstaff, Ariz.), and Steven G. Fryberger (Geological Survey, Flagstaff, Ariz.) *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 5-48 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08B

The usefulness of manned observations and handheld-camera photographs from space is confirmed by the immediate application of Skylab 4 data to the study of sand seas. The Skylab 4 crew provided information that: (1) confirms a tentative global classification of eolian sand deposits based on observed similarities in most of the major deserts of the world; (2) allows the preparation of maps that show the relationships of sand deposits to each other, to sand source areas, to natural sand distribution barriers, and to human land use; and (3) allows the regional patterns of large-scale dune morphology to be studied in relation to rainfall distribution and surface winds. Four sites in the Sahara and sub-Sahara of northern Africa, four in the Namib and Kalahari Deserts of southern Africa, two in the Empty Quarter of Saudi Arabia, five in the Takla Makan and Gobi Deserts of China, and three in the trans-Caspian deserts of the U.S.S.R. were selected as well as additional areas in northern Africa, India, Mexico, and Australia. A.R.H.

N82-12494*# Texas Univ. at Austin.
GLOBAL TECTONICS: SOME GEOLOGIC ANALYSES OF OBSERVATIONS AND PHOTOGRAPHS FROM SKYLAB
W. R. Muehlberger, P. R. Gucwa, A. W. Ritchie, and E. R. Swanson *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 49-88 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08G

Spreading zones, transform faults, and subduction zones were observed visually and by hand-held camera on Skylab 4. Geological studies of these observations are discussed for the Near and Middle East, the Atacama fault in Chile, the Alpine Fault zone in New Zealand, the Sierra Madre Occidental, in Mexico, and the Caribbean/Americas plate boundary in Guatemala and Southern Mexico. A.R.H.

N82-12495*# California Inst. of Tech., Pasadena.
GEOLOGICAL FEATURES OF SOUTHWESTERN NORTH AMERICA
L. T. Silter, T. H. Anderson, C. M. Conway, J. D. Murray, and R. E. Powell *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 89-136 refs (For primary document see N82-12492 03-43)

Avail: NTIS MF A01; SOD HC $16.50 CSCL 08G

Photographic and visual observation of geological target areas were integrated with other aspects of the ground investigations to: (1) identify and evaluate zones of major faulting in south eastern California, Baja California, and northwestern Sonora; (2) develop a new key to the regional stratigraphy of the prebatholithic rocks of northern Baja California; (3) discover the most southwesterly known occurrence of Precambrian crystalline rocks in North America; (4) discover a previously unmapped section of Mesozoic volcanic rocks in southeastern California; and (5) contribute important overview perspectives to many regional geologic problems. Skylab 4 data are discussed for the San Andreas fault system and architecture of Southern California; Nothern Baja, California; Sierra Mazatan and Sierra del Alamo in Sonora, Mexico; the northwest Sonora coast fault zones; and Arizona, including that portion of the Colorado Plateau in the vicinity of the Grand Canyon. A.R.H.

N82-12496*# Geological Survey, Denver, Colo.
SKYLAB 4 OBSERVATIONS OF VOLCANOES. PART A: VOLCANOES AND VOLCANIC LANDFORMS. PART B: SUMMIT ERUPTION OF FERNANDIAN CALDERA, GALAPAGOS ISLANDS, ECUADOR
Jules D. Friedman, Grant Heiken (Low Alamos Scientific Labs., New Mexico), Tom Simkin (Smithsonian Inst., Washington, D.C.), and Arthur F. Krueger (NOAA, Washington, D.C.) *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 137-173 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08K

Terrestrial volcanic features were observed and photographed from Skylab 4 under a variety of viewing conditions and Sun angles. Eruptions of Sakura-zima in southern Kyushu, Japan and the remote Fernandina volcano in the Galapagos Islands provided rare documentation of eruption clouds. Remote volcanic regions were also surveyed including the Tibesti volcanic massif and the Emi Koussi Caldera in Chad; the Altiplano volcanic field of Bolivia, Argentina, and Chile; the Kanchatcha Penninsula, U.S.S.R.; and the southeastern central plateau of Mexico. The landforms of volcanic provinces of Hawaii, southern Italy, the Aleutian Islands, Oregon, and Washington State were also investigated. Previously unobserved relationships between geomorphology and structure and previously unmapped tectonic ligaments were revealed as well as stratigraphic or relative age distinctions between partly overlapping basaltic flows. A.R.H.

N82-12497*# Energy, Mines and Resources Canada, Ottawa (Ontario).
THE MANICOUAGAN IMPACT STRUCTURE OBSERVED FROM SKYLAB
M. R. Dence *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 175-190 refs (For primary document see N82-12492 03-43)
(Contrib-544) Avail: NTIS MF A01; SOD HC $16.50 CSCL 08B

From comprehensive views of eastern Canada provided by Skylab oblique photographs, the main elements of the multi-ring Manicougan structure can be defined. By gravitational scaling, the structure is an analog for 200 km diameter structures on Mars and Mercury and 400 km to 500 km basins on the Moon. Because much larger structures on the other planets have rings spaced at intervals of 2 to the 1/2 power spacing, it is of interest to know if rings with intermediate spacing can be identified. A.R.H.

N82-12498*# Environmental Research and Technology, Inc., Concord, Mass.
SNOW-MAPPING EXPERIMENT
James C. Barnes, Clinton J. Bowley, J. Thomas Parr, and Michael D. Smallwood *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 191-224 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08L

More than 300 hand-held camera photographs were taken of most part of the United States in which snow existed during the mission. The sites include the Sierra Nevada in California; the Salt-Verde Watershed in central Arizona; the Rocky Mountains in Colorado; the Great Salt Lake and Yellowstone Park in Utah and Wyoming; the Cascade Range in Washington and Oregon; the Black Hills in South Dakota; the Central Plains; and the Great Lakes. Snow in the European Alps; the Caucasus and Himalaya Mountains; the Pacific coastal areas of the U.S.S.R.; and New Zealand was also mapped. The experiment shows that: (1) a space observer can identify snow that photointerpreters cannot distinguish on a photograph of the same area, (2) can integrate, through partial cloud cover, to view the terrain, and (3) can select the optimum viewing angle and Sun angle and the appropriate film and filter combination to acquire the best data. A.R.H.

N82-12499*# Texas Univ. at Austin.
CULTURAL FEATURES IMAGED AND OBSERVED FROM SKYLAB 4
Robert K. Holz *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 225-242 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08B

Data from Skylab 4 observations of metropolitan complexes are limited to city outline, major transportation arteries, suburban built-up areas, overall textural patterns of the city as compared to those of adjacent areas, and the color or albedo. Typical agricultural patterns, forest regions, and transportation networks on rural landscapes can be discerned, as well as the disturbances of soil during construction and mining which expose surface materials of a different albedo. Photographs of Denver, Colorado; San Antonio, Texas, Chicago, Illinois, and San Diego, California are analyzed. A.R.H.

N82-12500*# California Univ., Berkeley.
VEGETATION PATTERNS
David M. Carneggie and Brain T. Fine (California Univ. at Davis) *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 243-262 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08F

In an effort to make meaningful observations of vegetation resources, the following sites and features were examined: (1) wheat in Argentina, Australia, and the U.S.; (2) rangelands in Australia, Africa, and the U.S.; (3) land use in Malayasia; (4) vegetation in New Zealand; (5) agriculture in California; (6) drought in northern Australia; (7) insect and disease damage in any of the sites; and (8) forest and range fires wherever found. The important factors that governed the ability of the crew to observe these features were angle of view from the spacecraft; atmospheric conditions; Sun angle; speed of the spacecraft; characteristics of natural and cultivated vegatation; and familiarity with the phenomena to be observed. User reaction to the imagery is discussed and photograph quality is evaluated. A.R.H.

N82-12501*# American Univ., Washington, D. C. Drought Analysis Lab.
REPORT ON SKYLAB 4 AFRICAN DROUGHT AND ARID LAND EXPERIMENT
N. H. MacLeod, J. S. Schubert, and P. Anaejionu *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 263-286 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08B

Vegetation patterns, flooding, soil erosion, interdunal water accumulation, natural drainage systems, and drainage patterns in the Black Volta and White Volta River basins were observed and photographed in an effort to determine the causes of desertification in the Sahel. The Niger Island delta in Mali was selected to examine the distribution and changing patterns of vegetation and flooding of the major freshwater resources in that drought-prone area. Observations Nimbus-3, Apollo-9, and Skylab of dust and cloud movements, vegetation patterns, land surface features, the color and distribution of surface water, and color changes of lakes within the drought zone show that widespread destructice land practices contribute to the arid conditions. A.R.H.

N82-12502# Office of Naval Research, Pasadena, Calif.
VISUAL OBSERVATIONS OF THE OCEAN
Robert E. Stevenson, L. David Carter (Geological Survey, Menlo Park, Calif.), Stephen P. VonderHaar (Univ. of Southern California, Los Angeles), and Richard O. Stone *In* NASA. Johnson Space

Flight Center Skylab Explores the Earth 1977 p 287-338 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08J

The Skylab 4 mission allowed large scale, dynamic features such as ocean currents and associated eddies to be observed, described, and photographed repeatedly. Examples of regional and topical studies are included which discuss ocean currents, plankton, internal waves, coastal-sediment plumes, subtropical convergence, windborne sediment entering the ocean, and the interaction of ocean waves and currents. The importance of the observation of mesoscale phenomena is discussed as well as the amendement of charts of ocean currents. A.R.H.

N82-12503*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
AN ASSESSMENT OF THE POTENTIAL CONTRIBUTIONS TO OCEANOGRAPHY FROM SKYLAB VISUAL OBSERVATIONS AND HANDHELD-CAMERA PHOTOGRAPHS
George A. Maul and Michael McCaslin *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 339-352 (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08J

The possible roles that space observes may play in oceanographic experimentation are considered in a discussion of several ocean photographs and visual observations made during the Skylab 4 mission. While hand-held camera photography has a distinct role in reconnaissance, it cannot surpass the quantitativeness of a multispectral observation from a known altitude. Significantly, many of the most interesting scenes were taken by the S190B camera, which produced very high resolution photographs taken from a vertical position. From the standpoint of long term oceanographic observation, quantitative observations are needed with accurate geographical positioning. Concurrent ocean surface observations are also needed to correlate the data. A.R.H.

N82-12504*# Geological Survey, Tacoma, Wash.
VISUAL OBSERVATIONS OF FLOATING ICE FROM SKYLAB
W. J. Campbell, R. O. Ramseier (Dept. of Environment, Ottawa, Ontario), W. F. Weeks (Cold Regions Research and Engineering Lab.), and J. A. Wayenberg *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 353-380 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 08L

The lake and sea ice visual observation experiment performed during the Skylab 4 mission was very successful. In the initial experiment design, the Gulf of St. Lawrence and Lake Ontario were chosen as prime sites at which ground-truth measurements and aircraft remote-sensing data were to be obtained. In addition, the Skylab 4 astronauts obtained excellent photographs of sea ice in the Sea of Okhotsk and in the James Bay portion of Hudson Bay and of icebergs in the Southern Ocean. Some of the sequential photographs contain very useful broad-scale information on the distribution of ice and ice types, the overall deformation patterns, and the amount of relative ice motion. A.R.H.

N82-12505*# Air Resources Lab., Las Vegas, Nev.
QUANTITATIVE ANALYSIS OF ATMOSPHERIC POLLUTION PHENOMENA
Darryl Randerson *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 381-406 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 13B

Approximately 75 photographs of air pollution events were taken during the 84-day Skylab 4 mission. This imagery may be separated into two categories according to the sources of the pollution: natural pollution, which consists of dust generated by wind, naturally induced forest fires, and smoke generated by volcanic activity, and manmade pollution, which includes brush fires, smoke plumes from stacks or open burning, contrails, and ship trails. Results of the analysis of some of the most interesting photographs are discussed in this section. Photographs of the following are analyzed: the Sakura-zime volcanic activity; dust clouds, the Los Angeles pollution pall; long smoke plums; an African brush fire, an Argentine forest fire, cirrus cloud plumes, and a snow streak. A.R.H.

N82-12506*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METEOROLOGICAL LAB APPLICATIONS OF SKYLAB HANDHELD-CAMERA PHOTOGRAPHS
W. C. Skillman and William E. Shenk *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 407-416 (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 04B

The high resolution and image contrast of Skylab 4 photographs reveal details of the cloud structure associated with extratropical storms that normally cannot be seen in routinely available meteorlogical satellite images. A stereopair take over southern Arizona and northwestern Mexico east of the Gulf of California provides a good example of the cirrus clouds associated with a subtropical jet stream and demonstrates the height differences of multilayered clouds. The effects of cold air flowing over the warmer waters of the eastern Great Lakes, New York, southern New England, and the Atlantic Ocean are detailed as well as the cloud structure of an occluded cyclone. A.R.H.

N82-12507*# National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
SOME ASPECTS OF TROPICAL STORM STRUCTURE REVEALED BY HANDHELD-CAMERA PHOTOGRAPHS FROM SPACE
Peter G. Black *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 417-462 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 04B

The most important contribution to the fields of tropical storm research was the stereophotography of tropical storm Ellen during the Skylab 4 mission. Features of mature tropical storms revealed by Skylab 4 photographs are discussed and compared with data obtained by NOAA-2, Nimbus-5, and a DMSP satellite. A.R.H.

N82-12508*# Chicago Univ., Ill.
MESOSCALE WAKE CLOUDS IN SKYLAB PHOTOGRAPHS
T. Theodore Fujita and Jaime J. Tecson *In* NASA. Johnson Space Flight Center Skylab Explores the Earth 1977 p 463-478 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 04B

Examination of mesoscale cloud patterns within the wakes of obstacles seen in Skylab photographs reveals the existence of specific types of wake clouds. Cumulus streets occur when the lapse rate above the surface is adiabatic with a medium to slow flow rate. Karman vortex streets occur when the lapse rate above the surface is small, zero, or negative, with a slow to medium flow impinging against a relatively large obstacle. Wake waves occur when the lapse rate above the surface is small with a medium to fast flow rate impinging against a relatively small obstacle. When the flow rate exceeds a critical value, the transverse waves tend to disappear, leaving only the diverging waves. These phenomena are illustrated in Skylab photographs of the Aleutian Islands, the Kuril Islands, the Antipodes, South Pacific Islands, and the Bouvet Island in the South Atlantic. A.R.H.

N82-12509*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MESOSCALE CLOUD FEATURES OBSERVED FROM SKYLAB
David E. Pitts, J. T. Lee (National Severe Storms Lab.), J. Fein (Oklahoma Univ., Norman), Y. Sasaki (Oklahoma Univ., Norman), Kit Wagner, and R. Johnson (Lockheed Electronics Co., Houston, Tex.) *In its* Skylab Explores the Earth 1977 p 479-501 refs (For primary document see N82-12492 03-43)
Avail: NTIS MF A01; SOD HC $16.50 CSCL 04B

The Skylab 4 mission study of severe storm development was designed to photograph cloud-street patterns, to estimate the physical dimensions of cloud streets, and to describe their relationship to other cloud features and to land features. The moisture convergence of cloud streets and whether cloud-street curvature was an indicator of the source of angular momentum that results in the generation of rotating storms as precursors to tornadoes was analyzed from photographs taken over the Great Lakes and South America. A.R.H.

N82-12510*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

PROGRESS IN RADAR SNOW RESEARCH

W. Stiles, F. T. Ulaby, A. K. Fung, and A. Aslam Feb. 1981 167 p refs

(Grant NsG-5335)

(NASA-CR-166709; RSL-TR-410-1) Avail: NTIS HC A08/MF A01 CSCL 08L

Multifrequency measurements of the radar backscatter from snow-covered terrain were made at several sites in Brookings, South Dakota, during the month of March of 1979. The data are used to examine the response of the scattering coefficient to the following parameters: (1) snow surface roughness, (2) snow liquid water content, and (3) snow water equivalent. The results indicate that the scattering coefficient is insensitive to snow surface roughness if the snow is drv. For wet snow, however, surface roughness can have a strong influence on the magnitude of the scattering coefficient. These observations confirm the results predicted by a theoretical model that describes the snow as a volume of Rayleig scatterers, bounded by a Gaussian random surface. In addition, empirical models were developed to relate the scattering coefficient to snow liquid water content and the dependence of the scattering coefficient on water equivalent was evaluated for both wet and dry snow conditions. Author

N82-12511# Utah State Univ., Logan. Electro-Dynamics Lab.

LIMIT ON REMOTE FTIR DETECTION OF TRACE GASES

A. S. Zachor (Atmospheric Radiation Consultants, Inc.), B. Bartschi, and M. Ahmadjian (AFGL) Sep. 1981 7 p refs

(Contract F19628-77-C-0203; AF Proj. 7670)

(AD-A104842; AFGL-TR-81-0272) Avail: NTIS HC A02/MF A01 CSCL 20/6

We studied the capability of a Fourier spectrometer system to remotely detect trace gases in localized clouds, e.g., stationary source effluents. Detection is based on the degree to which the observed IR spectral radiance contrast between the cloud and adjacent background is correlated with a computed reference spectrum. It is shown that trace gases can be reliably detected when spectral features are well below the noise level. The minimum detectable quantities (MDQ's) for various trace gases at one atmosphere total pressure are given. The MDQ's determine the combinations of gas column thickness and gas-background temperature difference that correspond to 95 percent detection probability and one percent false detection probability when an FTS system with modest-size foreoptics views the target through a path equivalent to approximately one air mass. Author (GRA)

N82-12512# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR RUBY QUADRANGLE, ALASKA

31 Jul. 1981 104 p refs

(Contract W-7405-eng-26)

(DE81-029982; GJBX-290-81) Avail: NTIS HC A06/MF A01

Field and laboratory data are presented for 693 water samples from the Ruby Quadrangle, Alaska. The samples were collected as part of the National Uranium Resource Evaluation Program to assess uranium exploration. The uranium analysis by fluorescence spectroscopy was modified to alow for the reduced volume of water samples available. Results are reported as ppb in the original water sample. Detection limits for all elements are listed. Statistical summaries of results reported on control samples, which were analyzed along with the samples included in the survey, are given. DOE

N82-12513# Washington Univ., Seattle.

CHEMICAL AND GEOCHEMICAL STUDIES OFF THE COAST OF WASHINGTON Progress Report, Sep. 1980 - Jul. 1981

R. Carpenter, comp. Jul. 1981 14 p refs

(DE81-030319; DOE/EV-70024/44) Avail: NTIS HC A02/MF A01

A series of marine chemical and geochemical investigations involving both laboratory studies and field studies off the coast of Washington is addressed. Most of the field work was on the Washington continental shelf, slope, and the submarine canyons indenting the shelf north of the Columbia River. The aim is to provide basic data required to characterize underlying chemical and physical processes and their rates which control the distributions, concentrations, and ultimate fate of some of the potentially hazardous agents associated with fossil fuel and/or nuclear power production or transportation. Laboratory and field experiments and theories derived from are used iteratively to investigate: (1) vertical transfer of trace chemicals from surface seawaters to underlying waters and sediments; (2) processes which may transfer certain chemicals from sediments back into the overlying water column; (3) redox processes which besides changing valence states of certain chemicals may alter their precipitation/dissolution tendencies, their biological availability and/or toxicity; and (4) accumulation histories of potentially hazardous chemicals in sediments during the past 100 years. DOE

N82-12514# University of Southern California, Los Angeles. Dept. of Petroleum Engineering.

FORMATION EVALUATION IN LIQUID-DOMINATED GEOTHERMAL RESERVOIRS

Iraj Ershaghi, Elmer E. Dougherty, and Lyman L. Handy Apr. 1981 106 p refs

(Contracts DE-AT03-76ET-28384; EY-76-S-03-0113)

(DOE/ET-28384/T1) Avail: NTIS HC A06/MF A01

Studies relative to some formation evaluation aspects of geothermal reservoirs are reported. The particular reservoirs considered were the liquid dominated type with a lithology of the sedimentary nature. Specific problems of interest included the resistivity behavior of brines and rocks at elevated temperatures and studies on the feasibility of using the well log resistivity data to obtain estimates of reservoir permeability. Brine viscosity data at elevated temperatures, effect of dissolved gases on brine resistivity, design of a modified API filter test apparatus, and modeling of filter cake buildup during drilling are discussed. DOE

N82-12515# Washington State Univ., Pullman. Coll. of Engineering.

HYDROLOGIC STUDIES SUPPORT, INTERCOMP CODE CONVERSION Annual Report

Vernon I. Ichimura 16 Oct. 1980 57 p refs

(Contract DE-AT06-79RL-10119)

(DE81-030318; DOE/RL-10119/1; RR-80/15-44) Avail: NTIS HC A04/MF A01

The primary cause of mass and energy balance errors noted in IBM xecuted INTERCOMP code results are due to lack of precision in computing the global values of mass and energy. The correction of this problem led to numerical comparisons between the CDC and IBM computer results. The differences are greatest at an onset of a physical system perturbation and decrease with succeeding time steps. Good numerical comparison with analytical solutions seem to further prove the authenticity of code results. DOE

N82-12516# Union Oil Co. of California, Los Angeles. Geothermal Div.

GEOTHERMAL RESERVOIR ASSESSMENT: NORTHERN BASIN AND RANGE PROVINCE STILLWATER PROSPECT, CHURCHILL COUNTY, NEVADA Final Report, Apr. 1979 - Jul. 1981

D. L. Ash, R. F. Dondanville, and M. S. Gulati Aug. 1981 35 p

(Contract DE-AC08-79ET-27012)

(DE82-000529; DOE/ET-27012/1) Avail: NTIS HC A03/MF A01

The two wells were drilled to total depths of 6946 ft and 10,014 ft with no significant drilling problems. A maximum reservoir temperature of 353 F was measured at 9950 ft. The most productive well flow tested at a rate of 152,000 lbs/hr with a wellhead temperature of 252 F and pressure of 20 psig. Based upon current economics, the Stillwater geothermal prospect is considered to be subcommercial for the generation of electrical power. This synopsis of the exploratory drilling activities and results contains summary drilling, geologic, and reservoir information from two exploratory geothermal wells. DOE

N82-12517# California Dept. of Conservation, Sacramento. Div. of Mines and Geology.
GEOPHYSICAL SURVEY, PASO ROBLES GEOTHERMAL AREA, CALIFORNIA, PART OF THE RESOURCE ASSESSMENT OF LOW- AND MODERATE-TEMPERATURE GEOTHERMAL RESOURCE AREAS IN CALIFORNIA Progress Report, 1979 - 1980
R. H. Chapman, Gordon W. Chase, and Les G. Younds 10 Nov. 1980 42 p refs
(Contract DE-FG03-79ET-37035)
(DE81-026038; DOE/ET-37035/T2) Avail: NTIS HC A03/MF A01

Some general background information concerning the geology and geothermal occurrences in the Southern Coast Ranges is included, as well as the more detailed information dealing with the Paso Robles area proper. Results from ground magnetic and gravity surveys, are discussed and interpreted. There is possible correlation in some places with known and suspected faults. There are also suggestions of local differences in the Tertiary rocks. DOE

N82-12518# California Dept. of Conservation, Sacramento. Div. of Mines and Geology.
RESOURCE ASSESSMENT OF LOW AND MODERATE-TEMPERATURE GEOTHERMAL WATERS IN CALISTOGA, NAPA COUNTY, CALIFORNIA Progress Report, 1979 - 1980
Les G. Youngs, C. Forrest Bacon, Rodger H. Chapman, Gordon W. Chase, Chris T. Higgins, Hasmukhrai H. Majmundar, and Gary C. Taylor 10 Nov. 1980 394 p refs
(Contract DE-FG03-79ET-37035)
(DE81-025559; DOE/ET-37035/T1) Avail: NTIS HC A17/MF A01

The USGS Geotherm file for California was updated and completed and the final data were compiled for a geothermal resources map of the State. The methodology used to determine the depth, configuration, flow rate, capacity, water quality, and location of the hottest water in the reservoir at Calistoga is described. The historical use of the resource is reviewed. Other aspects considered include general geology, magnetic surveys, gravity surveys, seismic reflection, and electrica resistivity of the resource. The hydrology and groundwater quality are related to the geological structure and formation as well as to resource assessment. The development of models for volume and temperature, and explatory drilling are also discussed. DOE

N82-12519# Battelle Columbus Labs., Ohio.
EXTENSIBLE BRIDGE-CONVEYOR CONCEPT DEVELOPMENT Final Technical Report
James C. Swain and Edward C. Mullen 21 Apr. 1981 92 p refs
(Contracts DE-AC01-79ET-14210; DI-BM-JO-177051)
(DE81-031973; DOE/ET-12453/T1) Avail: NTIS HC A05/MF A01

Optimum applications for the CES were identified. Concepts were developed for the interfaces between system components and between the CES and the continuous miner and the room conveyor. Configurations were chosen for the CES which optimize system use in the applications identified. Cost estimates were prepared and general operating specifications were defined. Chain was selected as the preferred conveying element. The CES appeared to be a logical choice over shuttle cars in low to medium seam mines and over conventional continuous haulage in seams up to 80 inches if 88 percent availability is obtained, and if typical entry and crosscut centerline distances are employed. Longer centerline distances imply clear advantages for the CES concept. T.M.

N82-12520# Skelly and Loy, Harrisburg, Pa.
EVALUATION OF NOVEL UNDERGROUND TRANSPORT SYSTEMS Final Report
Jun. 1981 134 p refs
(Contract DE-AC01-79ET-11268)
(DE81-030279; DOE/ET-11268/T3) Avail: NTIS HC A07/MF A01

The feasibility of new or novel underground haulage equipment for transporting personnel and supplies is assessed to determine their relative impact on productivity and the cost per ton that is attributable to this segment of the mining operation. Novel equipment in its current design can potentially alleviate many of the personnel and supply problems encountered in United States coal mines. A review of rail haulage systems and European underground mining provided the basis for the introduction of three novel haulage systems: monorail, floor-mounted trapped rail haulage, and chairlifts. It was determined that monorail and floor-mounted trapped rail haulage systems exhibit the highest potential for domestic utilization. Monorail haulage equipment along with conventional battery powered rubber-tired equipment and two rail haulage systems were theoretically applied to five different mine sizes. Each system was then reviewed on an economic, operational, maintenance, and safety basis. From each standpoint, the monorail compared favorably with the other haulage systems. DOE

N82-12521# Skelly and Loy, Harrisburg, Pa.
FEASIBILITY ANALYSIS OF TRENCH STRIP AND AUGER MINING Summary Report
Jun. 1981 209 p refs
(Contract DE-AC01-79ET-11268)
(DE81-027557; DOE/ET-11268/14) Avail: NTIS HC A10/MF A01

The feasibility of using Trench Strip and Auger Mining as a means to extract coal reserves which are presently considered uneconomical to mine or which would present undesirable environmental effects if extracted using conventional surface mining methods is assessed. The conclusion is that Trench Strip and Auger Mining, when used as a primary mining system, is a viable alternative to conventional surface mining. Economically, a savings in the selling price of at least $12 per ton (from $28 to $16) can be realized with this concept. Environmentally, the amount of surface area disturbed can be reduced to half, and the amount of overburden handled can be reduced to one-seventh that of a conventional mine. It was also discovered that the trench mine gave similar results on certain surface minable sites that are economically and environmentally sound. DOE

N82-12522# Pennsylvania State Univ., University Park. Coal Research Section.
DATA BASE FOR THE ANALYSIS OF COMPOSITIONAL CHARACTERISTICS OF COAL SEAMS AND MACERALS Quarterly Technical Progress Report, Feb. - Apr. 1981
A. Davis, N. H. Suhr, W. Spackman, P. C. Painter, P. L. Walker, and P. H. Ogiven Aug. 1981 96 p refs
(Contract DE-AC22-80PC-30013)
(DE81-031977; DOE/PC-30013/5) Avail: NTIS HC A05/MF A01

The first objective of the program is to understand the systematic relationships between the properties of coals and the second is to determine the nature of lateral and vertical variability in the properties of a single seam. Four coal samples showed significant decrease in calorific value during storage over a two-year period; the lower the calorific value and the higher the moisture of the samples, the greater was the decrease. Ninety-three coal samples and 454 selected printouts of coal data were provided on request to the coal research community. Maceral analysis of 5-cm subsections of column samples of the Lower Kittanning seam reveal some differences in the profiles of the seam collected from two different environmental settings. General trends in carbon, hydrogen, oxygen and nitrogen contents of the Lower Kittanning seam of western Pennsylvania are presented. DOE

N82-12523# Office of Energy Resources, Augusta, Maine.
PEAT RESOURCE EVALUATION: STATE OF MAINE Quarterly Report
Joel Davis and Walter Anderson 1981 7 p
(Contract DE-FG18-79FC-14690)
(DE82-000227; DOE/FC-14690/T1) Avail: NTIS HC A05/MF A01

The amount and location of fuel-grade peat that may be harvested and utilized in an environmentally acceptable manner in Maine were surveyed. The resources inventory provides a detailed evaluation of the peat deposits including maps showing areal extent, thickness, and distribution of peat, stratigraphic cross sections, and surficial mapping. Many deposits were visited to accurately assess the physical characteristics of the deposits and

to obtain laboratory samples. Representative samples from surveyed deposits are obtained through standard field sampling techniques. DOE

N82-12524# North Carolina Univ., Chapel Hill. Dept. of Geology.
PEAT DEPOSITS OF DISMAL SWAMP POCOSINS: CAMDEN, CURRITUCK, GATES, PASQUOTANK, AND PERQUIMANS COUNTIES, NORTH CAROLINA
R. L. Ingram and Lee J. Otte, (Kent State Univ., Ohio) Jul. 1981 31 p refs
(Contract DE-AC01-79ET-14693)
(DE81-029642; DOE/ET-14693/T3) Avail: NTIS HC A03/MF A01

The presence of peat is examined in the Dismal Swamp of northeastern North Carolina and southeastern Virginia. The deposits in North Carolina occupy an area of 76,800 acres containing about 68 million tons of moisture free peat. The deposits greater than 4 ft thick occupy an area of 34,700 acres containing about 43 million tons of peat. The surface elevation of the peat ranges from 15 to 20 ft. Two main types of peat are present: (1) a brown, decomposed fibrous peat usually found at the base of the thicker peats, and (2) a black, fine grained, highly decomposed peat that usually overlies the fibrous peat. Both peat types contain large amounts of wood. The moisture content ranges from 40 to 94% and usually increases with depth and total thickness of the peat. It is found that heat values for moisture free, low ash peats range from 8700 to 10,900 Btu/lb and the sulfur content ranges from 0.2 to 0.7%. DOE

N82-12525# Battelle Columbus Labs., Ohio.
EXTENSIBLE BRIDGE-CONVEYOR CONCEPTS FOR COAL-MINE FACE HAULAGE Final Technical Report
James C. Swain, David L. Thomas, and Edward C. Mullen 1981 87 p
(Contracts DE-AC01-79ET-14210; DI-DM-JO-177051)
(DE81-031974; DOE/ET-14210/T1) Avail: NTIS HC A05/MF A01

The objective was to develop design concepts for extensible bridge conveyors which can be used in multiples to form a continuous haulage system. Consultation services were provided by Jeffrey Mining Machinery Division on mining technology and B.F. Goodrich Engineered Systems Division on conveyor belt technology. Additional information was gathered in a mine visit, during visits to conveyor manufacturers, and contacts with several component suppliers. Three extensible conveyor approaches were selected and machinery arrangement and internal detail drawings were prepared for each. Two of the concepts are for a face haulage system in which separate nonconnected extensible conveyors are individually trammed into position to form a continuous haulage system. The third concept is for a connected extensible system similar to existing continuous face haulage systems but employing extensible rather than fixed-length bridges. Cost estimates were prepared for the three concepts. The concepts developed employ belt-type conveyors, however, chain-type conveyors were considered to be a viable alternative. DOE

N82-12526# Department of Energy, Washington, D. C. Assistant Administrator for Applied Analysis.
ANALYSIS REPORT: APPLIED ANALYSIS MODEL SUMMARIES
Dec. 1980 173 p
(DE81-029278; DOE/EIA-0293) Avail: NTIS HC A08/MF A01

Brief statements of each model's purpose are presented. Information on the models' characteristics, uses, and requirements is provided and sources for additional information are reported. T.M.

N82-12527# Geological Survey, Washington, D. C.
INTERACTIVE COMPUTER METHODS FOR GENERATING *MINERAL-RESOURCE MAPS*
James A. Calkins, Alan S. Crosby, Tod E. Huffman, Allen L. Clark, George T. Mason, Jr., and Robert J. Bascle 1980 75 p refs Presented at the 2nd U.S. Geol. Surv. Computer Symp., Reston, Va., 22-23 Mar. 1978
(CIRC-815) Avail: NTIS HC A04/MF A01

Two related methods for plotting computer generated maps as alternatives to conventional batch methods are devised. These methods are: Quick Plot, an interactive program whose output appears on a cathoe ray tube (CRT) device, and the interactive cartographic automatic mapping system (CAM), which combines batch and interactive runs. The output of the Interactive CAM system is final compilation (not camera-ready) paper copy. Both methods are designed to use data from the Computerized Resource Information Bank (CRIB) file in conjunction with a map-plotting program. Quick Plot retrieves a user selected subset of data from the CRIB file, immediately produces an image of the desired area on a CRT device, and plots data points according to a limited set of user selected symbols. The interactive CAM system links the output of an interactive CRIB retrieval to a modified version of the CAM program, which runs in the batch mode and stores plotting instructions on a disk, rather than on a tape. S.L.

N82-12528# Oak Ridge Gaseous Diffusion Plant, Tenn.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR WAINWRIGHT QUADRANGLE, ALASKA
30 Jun. 1981 80 p refs
(Contract W-7405-eng-26)
(DE81-028670; K/UR-336) Avail: NTIS HC A05/MF A01

Water samples were analyed for uranium content. Field and laboratory data are presented for 293 water samples from the Wainwright Quadrangle, Alaska. The samples were collected and laboratory analysis and data reporting were performed by the uranium resource evaluation project. DOE

N82-12529# Oak Ridge Gaseous Diffusion Plant, Tenn.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR POINT LAY QUADRANGLE, ALASKA
30 Jun. 1981 75 p refs
(Contract W-7405-eng-26)
(DE81-028669; K/UR-335) Avail: NTIS HC A04/MF A01

Uranium resources and areas for uranium exploration were assessed. Field and laboratory data are presented for 219 water samples from the Point Lay Quadragle, Alaska. Samples were collected and laboratory analysis and data reporting were performed by the uranium resource evaluation project. DOE

N82-12530# Oak Ridge Gaseous Diffusion Plant, Tenn.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR HARRISON BAY QUADRANGLE, ALASKA
30 Jun. 1981 78 p refs
(Contract W-7405-eng-26)
(DE81-028352; GJBX-252-81; K/UR-359) Avail: NTIS HC A05/MF A01

Field and laboratory data are presented for 328 water samples from the Harrison Bay Quadrangle, Alaska. The samples were collected and laboratory analysis and data reporting were performed. Results of reconnaissance of surface water, ground water, stream sediment and lake sediment, are reported. DOE

N82-12531# Oak Ridge National Lab., Tenn.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR TESHEKPUK QUADRANGLE, ALASKA
30 Jun. 1981 91 p refs
(Contract W-7405-eng-26)
(DE81-027408; GJBX-248-81; K/UR-346) Avail: NTIS HC A05/MF A01

Field and laboratory data are presented for 479 water samples which were collected and analyzed for uranium content. DOE

N82-12532# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
DETERMINATION OF GEOGRAPHIC LONGITUDES, LATITUDES AND AZIMUTHS WITH THE TRANSIT INSTRUMENT AP IN THE TEST GRID WESTHARZ [LAENGEN-, BREITEN- UND AZIMUTBESTIMMUNGEN MIT DEM PASSAGEINSTRUMENT AP 70 IM TESTNETZ WESTHARZ DER T.U. HANNOVER]
Hansdieter Grosse Frankfurt am Main Verlag des Instituts fuer Angewandte Geodaesie 1980 123 p refs In GERMAN;

ENGLISH summary
(Ser-B-249; ISSN-0071-9196) Avail: NTIS HC A06/MF A01

The results of the determination of geographic longitudes, latitudes and azimuths at the Laplace stations Bad Sachsa, Rowensberg, and Wulften, Recke, are reported. The azimuth from Wulften, Recke, to Bad Lauterberg, Gr. Knollen was measured. All three stations are triangulation points of the second order net. As reference station for the time determination, the observatory of Goettingen, meridian circle Reichenbach, was used. Its astronomic longitude is related to Hamburg, German Hydrographic Institute, in the BIH system of 1957/58. The observations performed, taking into account polar motion, are: (1) time (star transit times in the meridian, FK 4 - catalog); (2) latitude (meridian-zenith differences according to Horrebow-Talcott, general catalog with transformation to the system of FK 4); and (3) azimuth (star transit times in the azimuth of the earth target, FK 4 - catalog). The results are tabulated. An automatic recording and preprocessing system for the observation and evaluation of transit times is also described. Author (ESA)

N82-12533# Danish Meteorological Inst., Copenhagen.
THE ICE CONDITIONS IN THE GREENLAND WATERS
1980 69 p
(ISBN-87-7478-183-9) Avail: NTIS HC A04/MF A01

Charts showing weekly ice conditions for 1965 are presented. Thickness of fast ice measured at coastal stations is given and the number of icebergs sighted is reported. Polar ice progress is followed. Information on the size, boundary, age, water features, and topography is provided. For ice of land origin, the relative frequencies of bergy bits and growlers are indicated. Author (ESA)

N82-12534# Geological Survey, Albany, N.Y. Water Resorces Div.
WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1980. VOLUME 1: EASTERN NEW YORK EXCLUDING LONG ISLAND Annual Water Resources Investigation, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1981 322 p 3 Vol.
(PB81-227308; USGS/WRD/HD-81/030-Vol-1; USGS/WRD/NY-80/1-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1980 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of groundwater wells. Records for water discharge at 105 gaging stations, stage only at 10 gaging stations, and stage and content at 20 gaging stations and 18 other and reserviors water quality at 33 gaging stations; and water levels at 25 observation wells are presented. Also included are data for 63 crest-stage and 27-low-flow partial-record stations. GRA

N82-12535# Geological Survey, Albany, N.Y. Water Resources Div.
WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1980. VOLUME 3: WESTERN NEW YORK Annual Water Resources Investigation, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1981 257 p 3 Vol.
(PB81-227316; USGS/WRD/HD-81/032-Vol-3; USGS/WRD/NY-80/3-Vol-3) Avail: NTIS HC A12/MF A01 CSCL 08H

Water resources data for the 1980 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. Records for water discharge at 83 gaging stations, stage only at 14 gaging stations, stage and contents at 6 gaging stations and 2 other lakes and reservoirs, water quality at 19 gaging stations, 5 quality of precipitation stations, and water levels at 19 observation wells are presented. Also included are data for 52 crest-stage and 16 low-flow partial-record stations. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-12536* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES Quarterly Report, 1 Apr. - 30 Jun. 1981
Jul. 1981 461 p
(NASA-SP-7043(30)) Avail: NTIS HC $15.00 CSCL 10B

This bibliography lists 1546 reports, articles, and other documents introduced into the NASA scientific and technical information system from April 1, 1981 through June 30, 1981. B.W.

N82-12537# Aeronautical Research Inst. of Sweden, Stockholm.
A TWO-DIMENSIONAL STUDY OF THE MAXIMUM POWER THAT CAN BE OBTAINED FROM A WIND TURBINE IN A WIND SHEAR LAYER
Bo C. A. Johansson Apr. 1981 60 p refs
(FFA-134) Avail: NTIS HC A04/MF A01

A two dimensional study, where the undisturbed velocity field is given and allowed to vary arbitrarily vertically, and the location of the wind turbine is given, is presented. The maximum power is calculated by the method of calculus of variations. The maximum power of common wind velocity profiles is only slightly larger than the power, which is obtained by a constant relative wind speed retardation, while for a linear velocity profile there is a considerable difference. S.L.

N82-12538*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
WORKSHOP ON MICROWAVE POWER TRANSMISSION AND RECEPTION. WORKSHOP PAPER SUMMARIES
1980 1366 p refs Workshop held in Houston, Tex., 15-18 Jan. 1980 Document contains eight bound supplements
(NASA-TM-84064) Avail: NTIS HC A99/MF A01 CSCL 10A

Microwave systems performance and phase control are discussed. Component design and reliability are highlighted. The power amplifiers, radiating elements, rectennas, and solid state configurations are described. The proper sizing of microwave transmission systems is also discussed. For individual titles, see N82-12539 through N82-12568.

N82-12539*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SYSTEM PERFORMANCE CONCLUSIONS
G. D. Arndt *In its* Workshop on Microwave Power Transmission and Reception 1980 p 1-12 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

System sizing is discussed in terms of reduced power levels and antenna diameters smaller than 1 km. The microwave transmission efficiency for smaller SPS systems was investigated. Startup and shutdown operations were examined with emphasis on solar eclipse effects on the solar arrays. The antennas and subarray mechanical alignments are also discussed. T.M.

N82-12540*# Boeing Aerospace Co., Seattle, Wash.
SPS LARGE ARRAY SIMULATION
S. Rathjen, B. R. Sperber, and Ervin J. Nalos *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 14-23 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The computer programming efforts were directed primarily to beam pattern analysis. The computer programs used for simulation provide: verification of the reference design; definition

of feasible departures such as quantized distributions; the study of far-out sidelobe roll-off characteristics; the analysis of errors and failures; illumination function analysis to develop beam patterns for efficient collection; and beam shaping synthesis to meet environmental constraints. T.M.

N82-12541*# Axiomatix, Los Angeles, Calif.
AN ACTIVE ALIGNMENT SCHEME FOR THE MPTS ARRAY
Richard Iwasaki *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 26-31 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

In order to maximize the efficiency of the microwave power transmission system (MPTS), the surface of the array antenna must be extremely flat, which is difficult to achieve using passive techniques over the 1 km dimensions of the array. In order to achieve and maintain this required flatness, a rotating laser beam used for leveling applications on Earth was utilized as a reference system. A photoconductive sensor with a reflective collecting surface was used to determine the displacement and polarity of any misalignment and automatically engage a stepping motor to drive a variable-length mechanism to make the necessary corrections. Once aligned, little power is dissipated since a nulling bridge circuit that centers on the beam is used, an important alignment feature since even laser beams broaden considerably at 1 km distances. T.M.

N82-12542*# Los Alamos Scientific Lab., N. Mex.
IONOSPHERIC POWER BEAM STUDIES
Lewis M. Duncan and William E. Gordon (Rice Univ.) *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 32-43 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A power density level of 23 mW/sq cm is presented as a design specification based on theoretical calculations of a threshold for microwave ionosphere nonlinear interaction (thermal runaway). For comparable power densities, enhanced electron heating is observed to change the electron temperature by a factor of two or three, but not by an order of magnitude. T.M.

N82-12543*# Emmanuel Coll., Boston, Mass.
PROPOSED EXPERIMENTAL STUDIES FOR ASSESSING IONOSPHERIC PERTURBATIONS ON SPS UPLINK PILOT BEAM SIGNAL
Santimay Basu and Sunanda Basu *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 44-54 refs (For primary document see N82-12538 03-44)
(Contract F19628-78-C-0005; Grant NSF ATM-78-25264)
Avail: NTIS HC A99/MF A01 CSCL 10A

The microwave beam of the proposed Solar Power Satellite (SPS) at geosynchronous altitude is to be formed and directed by phase information derived from a pilot signal at 2.45 GHz transmitted from ground and received in a number of module locations on the SPS antenna. The frequency of the pilot signal was chosen to be sufficiently low as to avoid the effects of strong scattering by turbulence in the neutral atmosphere and yet high enough to avoid any possible reofractive effects caused by the ionized upper atmosphere. The propagation of the uplink pilot signal through the ionosphere which contains natural and possibly some artificial irregularities, was studied. T.M.

N82-12544*# LinCom Corp., Pasadena, Calif.
PERFORMANCE ANALYSIS AND SIMULATION OF THE SPS REFERENCE PHASE CONTROL SYSTEM
W. C. Lindsey and C. M. Chie *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 58-74 refs (For primary document see N82-12538 03-44)
(Contract NAS9-15782)
Avail: NTIS HC A99/MF A01 CSCL 10A

Key results pertinent to the SPS reference phase control system design are summarized. These results are a consequence of extensive system engineering tradeoffs provided via mathematical modeling, optimization, analysis and the development/utilization of a computer simulation tool called SOLARSIM. T.M.

N82-12545*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
DESIGN AND BREADBOARD EVALUATION OF THE SPS REFERENCE PHASE CONTROL SYSTEM CONCEPT
P. M. Hopkins and V. R. Rao *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 75-84 (For primary document see N82-12538 03-44)
(Contract NAS9-15800)
Avail: NTIS HC A99/MF A01 CSCL 10A

Efficient operation of a very large phased array such as the proposed solar power satellite, requires precision focusing and pointing of the power beam; i.e., the power beam must have a planar wavefront directed precisely at the center of the target antenna (rectenna). To maintain such a power beam requires real-time phase compensation at each subaperture in order to adjust for structural deformations and other transitory factors. In the current solar power satellite (SPS) baseline, the spaceborne antenna (Spacetenna) is an active retrodirective array. A pilot signal transmitted from the center of the rectenna is phase-conjugated at each subaperture (power module) of the spacetenna, thereby assuring that the radiated composite wave is focused on the target. This scheme requires a large amount of precision electronic circuitry on the spacetenna. Specifically, pilot receivers must be located at each power module and an adaptive distribution network is required in order to provide a properly phased reference signal at each conjugator. T.M.

N82-12546*# LinCom Corp., Pasadena, Calif.
COHERENT MULTIPLE TONE TECHNIQUE FOR GROUND BASED SPS PHASE CONTROL
C. M. Chie *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 85-94 refs (For primary document see N82-12538 03-44)
(Contract NAS9-15782)
Avail: NTIS HC A99/MF A01 CSCL 10A

The ground based phase control concept was studied as an alternative approach to the reference SPS phase control system. The details of the ground based phase control system study are documented. The coherent multiple tone technique used for the ground based phase measurement waveform design and phase control system is summarized. T.M.

N82-12547*# Novar Electronics Corp., Barberton, Ohio.
AN INTERFEROMETER-BASED PHASE CONTROL SYSTEM
James H. Ott and James S. Rice *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 95-98 refs (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

A system for focusing and pointing the SPS power beam is discussed. The system is ground based and closed loop. One receiving antenna is required on Earth. A conventional uplink data channel transmits an 8-bit phase error correlation back to the SPS for sequential calibration of each power module. Beam pointing resolution is better than 140 meters at the Rectenna. T.M.

N82-12548*# Novar Electronics Corp., Barberton, Ohio.
A SONIC SATELLITE POWER SYSTEM MICROWAVE POWER TRANSMISSION SIMULATOR
James H. Ott and James S. Rice *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 97-99 ref (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10C

A simulator which generates and transmits a beam of audible sound energy mathematically similar to the SPS power beam is described. The simulator provides a laboratory means for analysis of ground based closed loop SPS phase control and of ionospheric effects on the SPS microwave power beam. T.M.

N82-12549*# Boeing Aerospace Co., Seattle, Wash.
SPS PHASE CONTROL STUDIES
W. W. Lund, B. R. Sperber, and G. R. Woodcock *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 100-109 (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

To properly point and form the SPS microwave power beam, the outputs of the power amplifiers in the transmitting array must be phased in a specific and coherent fashion. The purpose of the SPB phase control system is to bring this about reliably. A number of different phase control schemes were studied. The one selected for the SPS baseline system is a retrodirective CW phase that is distributed via fiber optics. The basis of this selection is relative technical simplicity and requisite assurance of success. T.M.

N82-12550*# Boeing Aerospace Co., Seattle, Wash.
SPS FIBER OPTIC LINK ASSESSMENT
T. O. Lindsay and Ervin J. Nalos *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 110-114 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Fiber optic technology was selected in the SPS baseline design to transmit a stable phase reference throughout the microwave array. Over a hundred thousand microwave modules are electronically steered by the phase reference signal to form the power beam at the ground receiving station. The initially selected IF distribution frequency of the phase reference signal was set at 980 MHz or a submultiple of it. Fiber optics offers some significant advantages in view of the SPS application. Optical transmission is highly immune to EMI/RFI, which is expected to be severe when considering the low distribution power. In addition, there will be savings in both mass, physical size, and potentially in cost. T.M.

N82-12551*# Rockwell International Corp., Pittsburgh, Pa.
IONOSPHERIC EFFECTS IN ACTIVE RETRODIRECTIVE ARRAY AND MITIGATING SYSTEM DESIGN
A. K. Nandi and C. Y. Tomita *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 115-125 refs (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The operation of an active retrodirective array (ARA) in an ionospheric environment (that is either stationary or slowly-varying) was examined. The restrictions imposed on the pilot-signal structure as a result of such operation are analyzed. A 3-tone pilot beam system is defined which first estimates the total electron content along paths of interest and then utilizes this information to aid the phase conjugator so that correct beam pointing can be achieved. T.M.

N82-12552*# Boeing Aerospace Co., Seattle, Wash.
HIGH EFFICIENCY SPS KLYSTRON DESIGN
Ervin J. Nalos *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 127-136 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The most likely compact configuration to realize both high efficiency and high gain is a 5-6 cavity design focused by an electromagnet. An outline of a potential klystron configuration is given. The selected power output of 70 kW CW resulted from a maximum assumed operating voltage of 40 kV. The basic klystron efficiency cannot be expected to exceed 70-75% without collector depression. Although impressive gains were achieved in raising the basic efficiency from 50% to 70% or so with a multi-stage collector, the estimated efficiency improvement due to 5-stage collector at the 75% level is only about 8% resulting in an overall efficiency of about 83%. T.M.

N82-12553*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTIC INVESTIGATION OF EFFICIENCY AND PERFORMANCE LIMITS IN KLYSTRON AMPLIFIERS USING MULTIDIMENSIONAL COMPUTER PROGRAMS; MULTISTAGE DEPRESSED COLLECTORS; AND THERMIONIC CATHODE LIFE STUDIES
H. G. Kosmahl *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 139-146 refs (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Due to complexity of the program which used a hydrodynamic, axially and radially deformable disk-ring model and the resulting long computing time only the output gap was investigated. Results from independent studies were used to initiate the starting conditions for the electrons and the RF voltage using our program. Although this method of computation is less exact than processing the entire klystron interaction in 3-Dimensions it is shown that, for a confined flow focused throughout the penultimate cavity, radial velocities remain very small and the beam is highly laminar. It is concluded that possible errors resulting from treating only the output cavity in 3-D would remain small. T.M.

N82-12554*# Raytheon Co., Waltham, Mass. New Products Center.
THE ADAPTING OF THE CROSSED-FIELD DIRECTIONAL AMPLIFIER TO THE REQUIREMENTS OF THE SPS Progress Report
William C. Brown *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 147-155 refs (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Progress in adapting the crossed-field directional amplifier to the SPS is reviewed. Special emphasis is given to (1) recent developments in controlling the phase and amplitude of the microwave power output, (2) a received architecture for its placement in the subarray, and (3) recent developments in the critical pivotal areas of noise, potential cathode life, and efficiency. Author

N82-12555*# Boeing Aerospace Co., Seattle, Wash.
SPS ANTENNA ELEMENT EVALUATION
C. D. Lunden, W. W. Lund, and Ervin J. Nalos *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 158-165 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The SPS transmitting array requires an architecture which will provide a low weight, high efficiency and high structural rigidity. Waveguide slot arrays constitute the most desirable option. Consequently, such an array was chosen for the SPS. Waveguide slot arrays offer high efficiency, uniform illimination, and are fairly lightweight. Bandwidths of such arrays are narrow, typically 1/2-2%. Although this does not directly impact the SPS, which transmits power at a single frequency of 2.45 GHz, the narrow bandwidth does constrain the thermal and mechanical tolerances of the antenna. The purpose of this program is to better define the electronic aspects of an SPS specific waveguide slot array. The specific aims of the program are as follows: (1) To build a full-scale half-module, 10 stick, array, the design parameters for which are to be determined analytical considerations tempered by experimental data on a single slotted radiating stick, (2) To experimentally evaluate the completed array with respect to antenna pattern, impedance and return loss; and (3) To measure swept transmission amplitude and phase to provide a data base for design of a receiving antenna. L.F.M.

N82-12556*# Rockwell International Corp., Pittsburgh, Pa.
THE RESONANT CAVITY RADIATOR (RCR)
K. G. Schroeder, R. L. Carlise, and C. Y. Tomita *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 167-177 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The fundamental theory of MW antenna operation and basic array technology development status was used in the design of the 1-km diameter 5-Gw SPS microwave antenna. However, the aperture size and the high efficiency requirements make the MW antenna extremely complex. Studies show that the slotted waveguide array is one of the most efficient radiators for the antenna. Subsequent analyses show that the temperature interface between waveguides and dc-RF conversion tubes can cause severe thermal design problems on the array. An alternate design, the Resonant Cavity Radiator, is described here. L.F.M.

N82-12557*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF THICK WALL WAVE GUIDE ELEMENT
Ervin J. Nalos *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 180-187 (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

The SPS transmitting array requires an archetecture which will provide a low weight, high efficiency and high structural rigidity. As noted above, waveguide slot arrays constitute the most desirable option. Consequently, such an array has been chosen for the SPS. Waveguide slot arrays offer high efficiency, uniform illumination, are are fairly lighweight. Bandwidths of such arrays are narrow, typically 1/2-2%. Although this does not directly impact the SPS, which transmits power at a single frequency of 2.45 GHz, the narrow bandwidth does constrain the thermal and mechanical tolerances of the antenna. The purpose of this program is to better define the electronic aspects of an SPS specific waveguide slot array. The specific aims of the program are as follows: (1) To build a full-scale half-module, 10 stick, array, the design parameters for which are to be determined by analytical considerations tempered by experimental data on a single slotted radiating stick, (2) To experimentally evaluate the completed array with respect to antenna pattern, impedance and return loss, and (3) To measure swept transmission amplitude and phase to provide a data base for design of a receiving antenna. L.F.M.

N82-12558*# Raytheon Co., Waltham, Mass. New Products Center.

METHOD FOR PRECISION FORMING OF LOW-COST, THIN-WALLED SLOTTED WAVEGUIDE ARRAYS FOR THE SPS

William C. Brown *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 188-190 (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

A method for the precision-forming of thin-walled, slotted-waveguide arrays was devised. Models were constructed with temporary tools and evaluated. The application of the method to the SPS requirements is discussed. Author

N82-12559*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

CONSIDERATIONS FOR HIGH ACCURACY RADIATION EFFICIENCY MEASUREMENTS FOR THE SOLAR POWER SATELLITE (SPS) SUBARRAYS

D. J. Kozakoff, J. M. Schuchardt, and C. E. Ryan *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 191-200 refs (For primary document see N82-12538 03-44)

(Contract NAS8-33605)

Avail: NTIS HC A99/MF A01 CSCL 10A

The relatively large apertures to be used in SPS, small half-power beamwidths, and the desire to accurately quantify antenna performance dictate the requirement for specialized measurements techniques. Objectives include the following: (1) For 10-meter square subarray panels, quantify considerations for measuring power in the transmit beam and radiation efficiency to + or - 1 percent (+ or - 0.04 dB) accuracy. (2) Evaluate measurement performance potential of far-field elevated and ground reflection ranges and near-field techniques. (3) Identify the state-of-the-art of critical components and/or unique facilities required. (4) Perform relative cost, complexity and performance tradeoffs for techniques capable of achieving accuracy objectives. the precision required by the techniques discussed below are not obtained by current methods which are capable of + or - 10 percent (+ or - dB) performance. In virtually every area associated with these planned measurements, advances in state-of-the-art are required. L.F.M.

N82-12560*# Raytheon Co., Waltham, Mass. New Products Center.

THE HISTORY OF THE DEVELOPMENT OF THE RECTENNA

William C. Brown *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 203-212 refs (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

The history of the development of the rectenna is first reviewed through its early conceptual and developmental phases in which the Air Force and Raytheon Company were primarily involved. The intermediate period of development which involved NASA, Jet Propulsion Laboratory, and Raytheon is then reviewed. Some selective aspects of the current SPS rectenna development are examined. Author

N82-12561*# Boeing Aerospace Co., Seattle, Wash.

RECTENNA SYSTEM DESIGN

G. R. Woodcock and R. W. Andryczyk (GE) *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 213-222 (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

Various rectenna system options are discussed. Among these are the half-wave dipole, modified half-wave dipole, yagi, half-wave dipole stripline, air dielectric transmission line feed, full wavelength dipole stripline, parabolic horn, and parabolic trough. L.F.M.

N82-12562*# Rensselaer Polytechnic Inst., Troy, N. Y.

RECTENNA SESSION: MICRO ASPECTS

Ronald J. Gutmann *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 223-231 refs (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

Two micro aspects of rectenna design are discussed: evaluation of the degradation in net rectenna RF to DC conversion efficiency due to power density variations across the rectenna (power combining analysis) and design of Yagi-Uda receiving elements to reduce rectenna cost by decreasing the number of conversion circuits (directional receiving elements). The first of these involves resolvinga fundamental question of efficiency potential with a rectenna, while the second involves a design modification with a large potential cost saving. L.F.M.

N82-12563*# Novar Electronics Corp., Barberton, Ohio.

A THEORETICAL STUDY OF MICROWAVE BEAM ABSORPTION BY A RECTENNA

James H. Ott, James S. Rice, and Donald C. Thorn *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1981 p 234-240 refs (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

The results of a theoretical study of microwave beam absorption by a Rectenna are given. Total absorption of the power beam is shown to be theoretically possible. Several improvements in the Rectenna design are indicated as a result of analytic modeling. The nature of Rectenna scattering and atmospheric effects are discussed. Author

N82-12564*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RECTENNA ARRAY MEASUREMENT RESULTS

Richard M. Dickinson *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 244-250 refs (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

The measured performance characteristics of a rectenna array are reviewed and compared to the perfformance of a single element. It is shown that the performance may be extrapolated from the individual element to that of the collection of elements. Techniques for current and voltage combining were demonstrated. The array performance as a function of various operating parameters is characterized and techniques for overvoltage protection and automatic fault clearing in the array demonstrated. A method for detecting failed elements also exists. Instrumentation for deriving performance effectiveness is described. Measured harmonic radiation patterns and fundamental frequency scattered patterns for a low level illumination rectenna array are presented. Author

N82-12565*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SESSION ON SOLID STATE: INTRODUCTION

In its Workshop on Microwave Power Transmission and Reception 1980 p 253-257 (For primary document see N82-12538 03-44)

Avail: NTIS HC A99/MF A01 CSCL 10A

The possibilities of using solid state devices as part of the Satellite Solar Power System are discussed. Solid state advantages and disadvantages are presented along with two potential concepts for use of solid state in the system design. L.F.M.

N82-12566*# Boeing Aerospace Co., Seattle, Wash.
MODIFIED REFERENCE SPS WITH SOLID STATE TRANSMITTING ANTENNA
G. R. Woodcock and B. R. Sperber *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 258-267 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

The motivations for considering solid state microwave power amplifiers for the solar power satellite transmitting antenna are the possibilities of greatly increased system reliability due to elimination of electron tube cathodes, a lower mass per unit power and transmitting array area due to the high power densities obtainable in semiconductors, and, probably, cost savings due to development of small hardware items that can be handled by individuals instead of organizations. In order to provide a fair assessment where we stand today with regard to solid state SPS technology, the design described here is close to that of the NASA/DOE reference and is implemented using today's solid state technology with only a small 'push'. The small push is raising the efficiency of DC-RF conversion from the .68 obtained by RCA in 1975 to somewhat over .8 of the solid state SPS. This is generally considered feasible by semiconductor industry representatives. Other solid state SPS configurations can yield somewhat better performance. However, these generally do not provide as fair a vehicle for comparison with the reference and usually also incorporate somewhat more advanced technologies. L.F.M.

N82-12567*# Boeing Aerospace Co., Seattle, Wash.
SPS SOLID STATE ANTENNA POWER COMBINER
G. W. Fitzsimmons *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 268-277 (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Solid state dc-rf converters offer potential improvements in reliability, mass and low voltage operation, provided that anticipated efficiencies in excess of 80 percent can be realized. Field effect transistors offer the greatest potential in the SPS frequency band at 2.45 GHz. To implement this approach it is essential that means be found to sum the power of many relatively low power solid state sources in a low-loss manner, and that means be provided to properly control the phase of the outputs of the large number of solid state sources required. To avoid the power combining losses associated with circuit hybrids it was proposed that the power from multiple solid state amplifiers be combined by direct coupling of each amplifier's output to the radiating antenna structure. The selected power-combining antenna consists of a unique printed (metalized) microstrip circuit on a ceramic type dielectric substrate which is backed by a shallow lightweight aluminum cavity which sums the power of four microwave sources. The antenna behaves like two one-half wavelength slot-line antennas coupled together via their common cavity structure. L.F.M.

N82-12568*# Rockwell International Corp., Pittsburgh, Pa.
SOLID-STATE RETRODIRECTIVE PHASED ARRAY CONCEPTS FOR MICROWAVE POWER TRANSMISSION FROM SOLAR POWER SATELLITE
K. G. Schroeder and I. K. Petroff *In* NASA. Johnson Space Center Workshop on Microwave Power Transmission and Reception 1980 p 279-298 ref (For primary document see N82-12538 03-44)
Avail: NTIS HC A99/MF A01 CSCL 10A

Two prototype solid-state phased array systems concepts for potential use in the Solar Power Satellite are described. In both concepts, the beam is centered on the rectenna by means of phase conjugation of a pilot signal emanating from the ground. Also discussed is on-going solid-state amplifier development. L.F.M.

N82-12569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTROCHEMICAL MODELS FOR THE DISCHARGE CHARACTERISTICS OF THE NICKEL CADMIUM CELL
Michael S. Spritzer (Villanova Univ.) Aug. 1981 19 p
(NASA-TM-83814) Avail: NTIS HC A02/MF A01 CSCL 10C

The potential time characteristics of a preconditioned fully charged cell discharge at constant current was studied. Electrochemical principles applied to the sealed nickel cadmium cell and its behavior and to predict operating characteristics were described. A thermodynamic approach to arrive at several related but different equations and its discharge are reported. E.A.K.

N82-12570*# Gilbert/Commonwealth, Reading, Pa.
MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWe POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). VOLUME 1: EXECUTIVE SUMMARY Final Report
Sep. 1981 48 p
(Contracts DEN3-224; DE-AI01-77ET-10769)
(NASA-CR-165452-Vol-1; DOE/NASA-0224/1-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 10B

Main elements of the design are identified and explained, and the rationale behind them was reviewed. Major systems and plant facilities are listed and discussed. Construction cost and schedule estimates are presented, and the engineering issues that should be reexamined are identified. The latest (1980-1981) information from the MHD technology program is integrated with the elements of a conventional steam power electric generating plant. T.M.

N82-12571*# Boeing Co., Seattle, Wash.
TESTING OF SOLAR CELL COVERS AND ENCAPSULANTS CONDUCTED IN A SIMULATED SPACE ENVIRONMENT Final Report
D. A. Russell Nov. 1981 267 p
(Contract NAS3-22222)
(NASA-CR-165475; D180-26590-1) Avail: NTIS HC A12/MF A01 CSCL 10A

The materials included in the evaluation were 0211 microsheet, FEP-A used as a cover and as an adhesive, DC 93-500 adhesive, PFA 'hard coat' used as a cover, GE 615/UV-24 used as a cover, GR 650 used as a cover, and electrostatically bonded 7070 glass. The test environments were 1 MeV electron irradiation interspersed with thermal cycling, 0.5 MeV proton irradiation interspersed with thermal cycling and UV exposure interspersed with thermal cycling. Summary data is given describing the response of the test materials both visually and electrically to the three different environments. T.M.

N82-12572*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
LOW NO SUB X HEAVY FUEL COMBUSTOR CONCEPT PROGRAM Final Report, 23 Oct. 1979 - Jul. 1981
Paul Russell, George Beal, and Bruce Hinton 15 Oct. 1981 99 p refs Prepared in cooperation with Pratt and Whitney Aircraft, East Hartford, Conn.
(Contracts DEN3-149; DE-AI01-77ET-13111)
(NASA-CR-165512; DOE/NASA/0149-1; QTR-3236) Avail: NTIS HC A05/MF A01 CSCL 10B

A gas turbine technology program to improve and optimize the staged rich lean low NOx combustor concept is described. Subscale combustor tests to develop the design information for optimization of the fuel preparation, rich burn, quick air quench, and lean burn steps of the combustion process were run. The program provides information for the design of high pressure full scale gas turbine combustors capable of providing environmentally clean combustion of minimally of minimally porcessed and synthetic fuels. It is concluded that liquid fuel atomization and mixing, rich zone stoichiometry, rich zone liner cooling, rich zone residence time, and quench zone stoichiometry are important considerations in the design and scale up of the rich lean combustor. E.A.K.

N82-12573*# Stonehart Associates, Inc., Madison, Conn.
PREPARATION AND EVALUATION OF ADVANCED ELECTROCATALYSTS FOR PHOSPHORIC ACID FUEL CELLS Quarterly Report
Paul Stonehart, John Baris, John Hochmuth, and Peter Pagliaro 30 Sep. 1981 31 p
(Contracts DEN3-176; DE-AI03-80ET-17088)
(NASA-CR-165519; DOE/NASA/0176-81/4; QR-7) Avail: NTIS HC A03/MF A01 CSCL 10A

A number of electrocatalyst combinations were prepared and

characterized. These electrocatalysts were formulated to contain platinum combined with transition metal carbide forming elements (W, Mo, V) for cathodes and platinum combined with palladium for anodes. High resolution electron microscopy was used to determine the crystallite size and dispersion of platinum-palladium alloy electrocatalysts in order to provide analytical support for the electrochemical determinations of the particle dispersions. An equation was derived which correlates palladium crystallite size with electrochemical hydrogen adsorption. Based on comparisons of electrocatalyst performances in the presence of pure hydrogen and hydrogen containing carbon monoxide, it was shown that the apparent poisoning of the electrocatalyst by carbon monoxide is influenced by the electrode structure.
DOE

N82-12574*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF ADVANCED CHROMIUM ELECTRODES FOR THE NASA REDOX ENERGY STORAGE SYSTEM Final Report
Randall F. Gahn, JoAnn Charleston, Jerri S. Ling, and Margaret A. Reid Nov. 1981 23 p refs
(Contract DE-AI04-80AL-12726)
(NASA-TM-82724; E-1025; DOE/NASA/12726-15) Avail: NTIS HC A02/MF A01 CSCL 10C

Chromium electrodes were prepared for the NASA Redox Storage System with meet the performance requirements for solar-photovoltaic, wind-turbine and electric utility applications. Gold-lead catalyzed carbon felt electrodes up tp 930 sq cm were fabricated and tested in single cells and multicell stacks for hydrogen evolution, coulombic efficiency, catalyst stability and electrochemical activity. Factors which affect the overall performance of a particular electrode include the carbon felt lot, the cleaning treatment and the gold catalyzation method. Effects of the chromium solution chemistry and impurities on charge/discharge performance are also presented. Author

N82-12575# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
VOLTAGE LOSSES AND RECONDITIONING OF NiCd CELLS: BEHAVIOR DURING CYCLING
Albert H. Zimmerman and Melanie C. Janecki 21 Aug. 1981 36 p refs
(Contract F04701-80-C-0081)
(AD-A105418; TR-0081(6970-0)-4; SD-TR-81-62) Avail: NTIS HC A03/MF A01 CSCL 10/3

The voltage losses that accompany the cycling of NiCd satellite cells are studied under a variety of operational conditions. The recovery of these losses through reconditioning procedures involving complete cell discharge is also examined. The results indicate that the voltage losses arise from a combination of thermodynamic and kinetic changes in the Ni electrode and that these changes result from a solid-state phase transformation in the Ni electrode active material. Author (GRA)

N82-12576# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
IMPEDANCE AND MASS TRANSPORT KINETICS OF NICKEL CADMIUM CELLS
Albert H. Zimmerman and Melanie C. Janecki 1 Sep. 1981 28 p refs
(Contract F04701-80-C-0081)
(AD-A105320; TR-0081(6970-01)-1; SD-TR-81-63) Avail: NTIS HC A03/MF A01 CSCL 10/3

The impedance of operating NiCd cells in the frequency range 0.001 to 100 Hz is characteristic of mass-transport processes that occur in the cells. Two diffusion processes are observed in the impedance spectrum, at least one of which appears to involve solid-state diffusion in a surface film. The diffusion characteristics have a pronounced dependence on cell current, as well as some dependence on cell state of charge and operating temperature. The diffusion properties of the NiCd cell do appear to be sensitive to the changes in morphological or chemical structure of the active materials that can occur during use.
Author (GRA)

N82-12577# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
ELECTROLYTES FOR RECHARGEABLE LITHIUM BATTERIES
Herbert F. Hunger Sep. 1981 15 p refs
(DA Proj. 1L1-61102-AH-47)
(AD-A105230; DELET-TR-81-17) Avail: NTIS HC A02/MF A01 CSCL 10/3

Theoretical considerations predict increased stability of cyclic ethers and diethers against reductive cleavage by lithium if the ethers have 2 methyl substitution. Diethers are solvents with low viscosity which are desirable for high rate rechargeable lithium batteries. Synergistic, mixed solvent effects increase electrolyte conductance and rate capability of lithium intercalating cathodes. Author (GRA)

N82-12578# Mazria (Edward) and Associates, Albuquerque, N. Mex.
PASSIVE SOLAR TECHNICAL PLANNING STUDY Final Report
Edward Mazria and M. S. Baker Oct. 1980 120 p refs
(EPRI-EM-1591; EPRI-TPS-79-750) Avail: NTIS HC A06/MF A01

The most promising passive solar techniques in buildings and their potential impact on electric utilities are examined. The differences between passive design and good energy conservation practices and the correlation between the passive solar contribution relative to reducing the building load from normal design practices are addressed. The potential for passive solar systems to alter residential load profiles, especially to reduce peaks for back-up energy needs is discussed. Computer code analysis techniques and capabilities required to simulate passive designs are presented. S.L.

N82-12579# Department of Energy, Washington, D. C.
DEPARTMENT OF ENERGY PROJECTS Quarterly Status Report
30 Jun. 1981 525 p
(DE82-000038; DOE/MA-0006/2) Avail: NTIS HC A22/MF A01

The report is designed to provide Department of Energy (DOE) management with a summary of the important baseline data that exists in the DOE project data base. This data base is maintained chiefly from periodic field management reports required by DOE Order 5700.4. Since most of the current estimates in this report are from field project managers, they do not necessarily have full headquarters approval. The current budget data sheet estimates that appear in the report are considered appropriate for reporting external to the Department. DOE

N82-12580# Data Resources, Inc., Lexington, Mass.
MODELS FOR FORECASTING ENERGY USE IN THE US FARM SECTOR Final Report
L. R. Christensen Electric Power Research Inst. Jul. 1981 200 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 682-1)
(DE81-904220; EPRI-EA-1956-Vol-1) Avail: NTIS HC A09/MF A01

Econometric models were developed and estimated for the purpose of forecasting electricity and petroleum demand in US agriculture. A structural approach is pursued which takes account of the fact that the quantity demanded of any one input is a decision made in conjunction with other input decisions. Three different functional forms of varying degrees of complexity are specified for the structural cost function, which describes the cost of production as a function of the level of output and factor prices. Demand for materials (all purchased inputs) is derived from these models. A separate model which break this demand up into demand for the four components of materials is used to produce forecasts of electricity and petroleum is a stepwise manner. DOE

N82-12581# Merix Corp., Wellesley, Mass.
ENERGY CONSERVATION IN DISTILLATION Final Report
T. W. Mix, J. S. Dweck, M. Weinberg, and R. C. Armstrong Jul. 1981 299 p refs
(Contract DE-AC07-76CS-40259)
(DE81-028650; DOE/CS-40259/1) Avail: NTIS HC A13/MF A01

An audit of major industrial and processes and key colums in each major process indicated that approximately twoquads of energy were consumed for distillation in the US in 1976. Energy usage by industry is included: petroleum refineries, 66% chemical (including petrochemical) industry, 29% natural gas liquids processing, 5%. Techniques and current practices for conserving distillation energy are reviewed, and guidelines indicating those process conditons which favor the use of each energy conserving technique are enumerated. Expressions for payout time for tray and control retrofit options are developed based on energy savings and increased throughput. Calculations for industrial colums suggested that both types of retrofits would frequently have short (.6 months) payout times based on either criterion. Extractive distillation is also discussed, and criteria enabling the estimation of the energy which may be conserved using this technique are developed. Good housekeeping practices and field techniques for checking the energy efficiency of industrial distillations are also discussed. DOE

N82-12582# Prototech, Inc., Newton Highlands, Mass.
ENERGY SAVINGS BY MEANS OF FUEL-CELL ELECTRODES IN ELECTRO-CHEMICAL INDUSTRIES Progress Report, 1 Feb. - 30 Apr. 1981
A. Bar-Ilan, Walter Juda, and Brian P. Finnigan 31 Jul. 1981 26 p refs
(Contract DE-AC02-78ET-25309)
(DE81-030975; DOE/ET-25309/T1; COO-4881-31) Avail: NTIS HC A03/MF A01

Life testing of palladium-loaded and low platinum-loaded anodes on type C supports and with type no. 01 current collectors was continued and terminated. Additional life-test data are reported for high Pt-loaded and a second low Pt-loaded anode. The 6 in. x 6 in. depth cell was operated at reduced hydrogen back pressures, and the effect of the resulting flooding of the hydrogen chamber upon cell performance was determined. Furthermore, two 6 in. x 6 in. depth cells were fabricated from the same type platinum support and current collector, but following different preparation procedures. Cell performance was compared at various submergence depths under identical operating conditions. DOE

N82-12583# Los Alamos Technical Associates, Inc., N. Mex.
THE SEVERITY OF INSTITUTIONAL BARRIERS AFFECTING ENERGY-FROM-MUNICIPAL-WASTE TECHNOLOGIES
G. E. Dials, J. M. Greenwood, L. L. Lewis, and E. M. Cole Jun. 1981 58 p refs Presented at Inst. Barriers Assessment Workshop, Washington, D.C., 19 Feb. 1981 Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE82-000133; ANL/CNSV-TM-79) Avail: NTIS HC A04/MF A01

The results from a workshop during which EMW experts were asked to indicate the importance of these barriers are summarized. The basic results of the workshop participants' scoring of the institutional barriers according to their importance are described. More elaborate analyses conducted on the workshop results are reported. A summary of the workshop results and a listing of the most important EMW technology/institutional barrier combinations are included. T.M.

N82-12584# Century Engineering, Inc., Towson, Md.
EVALUATION OF LANDFILL GAS AS AN ENERGY SOURCE
Dec. 1980 45 p refs
(Contract DE-FG02-78IR-05106)
(DE82-000116; DOE/IR-05106/T47) Avail: NTIS HC A03/MF A01

The benefits and problems associated with landfill gas recovery were considered by the City of Baltimore, resulting in the structuring and testing of a realistic gas recovery evaluation procedure for use by local governments. The Baltimore methodology is summarized and results of its application to a large landfill in the Baltimore area are presented. The landfill gas generation process potential uses for the recovered gas, and treatment requirements are covered. DOE

N82-12585# Battelle Pacific Northwest Labs., Richland, Wash.
UNITED STATES DEPARTMENT OF ENERGY THERMAL STORAGE PROGRAM
J. H. Swisher (DOE, Washington, D.C.) and W. A. Frier 1981 36 p refs
(Contracts DE-AI01-78CS-35217; DE-AC06-76RL-C1830; EM-78-1-01-5217)
(DE81-030263; DOE/RL-01830/T6) Avail: NTIS HC A03/MF A01

Thermal energy storage devices, processes, and subsystems that permit domestic energy resources to be supplied at the time and locations where they can be used are developed. Daily storage for active or passive solar and conventional heating and cooling, seasonal storage for building heating and cooling, thermal energy transport, thermal power storage, and chemical heat pumps are emphasized. DOE

N82-12586# Battelle Pacific Northwest Labs., Richland, Wash.
BIBLIOGRAPHY OF THE SEASONAL THERMAL ENERGY STORAGE LIBRARY
L. S. Prater, G. Casper (Midwest Research Inst.), and R. A. Kawin (Control Data Corp.) Aug. 1981 310 p
(Contract DE-AC06-76RL-01830)
(DE81-030470; PNL-3645) Avail: NTIS HC A14/MF A01

Seasonal storage of thermal energy which contributes to the relief of the national energy storage is described. Various forms of surplus energy (winter chill, summer heat, and industrial waste heat) are stored till needed. Potential storage media include: aquifers, lakes, ponds, and earth. Storage of thermal energy in aquifers is chosen for initial development. Other methods of seasonal storage are also evaluated. DOE

N82-12587# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ASSESSMENT OF THE POTENTIAL OF COAL-FUELED HEAT ENGINES IN TOTAL AND INTEGRATED ENERGY SYSTEMS
J. C. Bratis, M. L. Jain, and T. J. Marciniak Jun. 1981 80 p refs
(Contract W-31-109-eng-38)
(DE82-000169; ANL/FE-81-56) Avail: NTIS HC A05/MF A01

The potential of several prime movers, especially those that use coal, for use in total and integrated energy systems in the residential and commercial sector was investigated. The prime movers considered are diesels, Stirlings, internally and externally fired gas turbines, and steam turbines. Total energy systems based on the prime movers are compared to the conventional system for four communities that represent different ratios of residential to commercial area. The energy savings, environmental effects, and economic benefits are shown. It is found that for both scenarios, neither coal nor oil using total energy systems have a definite economic advantage. DOE

N82-12588# Oak Ridge National Lab., Tenn. Energy Div.
DETECTING OUTLIERS IN ENERGY TIME-SERIES DATA
Michael R. Chernick (Aerospace Corp., Los Angeles), Darryl J. Downing, and David H. Pike Aug. 1981 43 p refs
(DE81-030230; ORNL/TM-7460) Avail: NTIS HC A03/MF A01

Occasional large errors in energy data can have drastic effects on estimates for such quantities as correlation coefficients, regression coefficients, and spectral density estimates. The effect of outliers on time series was investigated by considering the influence function for the autocorrelations p(k) of a stationary time series. Effects on estimates of the spectrum for power plant data are then shown. Finally, asymptotic theory was derived for the maximum average square influence function in order to formally test for outliers in stationary Gaussian sequences. DOE

N82-12589# Department of Energy, Washington, D. C. Industrial Data Systems Div.
NATIONAL INTERIM ENERGY-CONSUMPTION SURVEY: EXPLORING THE VARIABILITY IN ENERGY CONSUMPTION
Robert Latta, Thomas H. Woteki, Lynda Carlson, Wendel Thompson, and Kenneth Vagts Jul. 1981 70 p refs
(DE81-029910; DOE/EIA-0272) Avail: NTIS HC A04/MF A01

The variation in total energy consumption and consumption

by end use are described. The report concentrates on regression models for describing the variability in natural gas and electricity consumption for households living in single family detached houses. Sample data and the subsets used in the analyses are described. A theoretical model for describing a household's energy consumption is presented. Graphical summaries of the data which serve to explain the specific models fit to the data are also presented. The empirical models fit to the data, and the method of fitting, are discussed. Results, speculation on interpretation of the model coefficients, and potential uses of the model are summarized. DOE

N82-12590# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
SECURITY ASSESSMENT OF POWER SYSTEMS INCLUDING ENERGY STORAGE AND WITH THE INTEGRATION OF WIND ENERGY Progress Report, 1 Apr. - 30 Jun. 1981
D. P. Carroll and P. C. Krause Jul. 1981 17 p
(Contracts DE-AS02-77ET-29100; EC-77-S-02-4206)
(DE81-030166; DOE/ET-29100/T1) Avail: NTIS HC A02/MF A01

Methods of Resynchronizing wind turbine generators, and performance of wind turbines in a turbulent atmosphere, were discussed. The work on reduced order modeling by SEPI is reported. Aggregation techniques which have been formulated are validated. DOE

N82-12591# Sandia Labs., Albuquerque, N. Mex. Advanced Energy Project Div.
VERTICAL-AXIS WIND-TURBINE CONTROL STRATEGY
Gerald M. McNerney Aug. 1981 21 p refs
(Contract DE-AC04-76DP-00789)
(DE81-031932; SAND-81-1156) Avail: NTIS HC A02/MF A01

Early expense in automatic operation of the Sandia 17-m vertical axis research wind turbine (VAWT) demonstrated the need for a systematic study of control algorithms. To this end, a computer model was developed that uses actual wind time series and turbine performance data to calculate the power produced by the Sandia 17-m VAWT operating in automatic control. The model was used to investigate the influence of starting algorithms on annual energy production. The results indicate that, depending on turbine and local wind characteristics, a bad choice of a control algorithm can significantly reduce overall energy production. The model can be used to select control algorithms and threshold parameters that maximize long-term energy production. DOE

N82-12592# COECORP, Mountain View, Calif.
INVESTIGATION AND RESEARCH OF SPECIFIC COMBUSTION-TURBINE AND COMBINED-CYCLE FIELD PROBLEMS Annual Report
Aug. 1981 62 p Prepared in cooperation with Aptech Engineering Services, Inc. Sponsored by Electric Power Research Inst.
(EPRI Proj. 1802)
(DE81-904231; EPRI-AP-1981) Avail: NTIS HC A04/MF A01

Specific combustion turbine and combined cycle field problems are discussed. These are (1) fuel filter plugging, (2) apparent compressor surge, (3) oily waste water, (4) compressor wheel failure, and (5) combuator problems. Results of research efforts are outlined. DOE

N82-12593# Rocket Research Corp., Redmond, Wash.
UTILIZATION OF WASTE HEAT FROM MAJOR TRANSFORMER SUBSTATIONS. VOLUME 1: GENERIC STUDY Final Report
N. T. Christensen Aug. 1981 190 p refs Sponsored by Electric Power Research Inst. 2 Vol.
(EPRI Proj. 1274-1)
(DE81-904212; EPRI-EM-1968-Vol-1) Avail: NTIS HC A09/MF A01

Large substation transformers reject substantial thermal energy. Since these units are usually close-coupled to facilities requiring low-temperature thermal energy for space conditioning, the ability to recover and efficiently utilize this energy is of significant interest. The intent of this project was to analytically evaluate the technical and economic potential of transformer waste heat recovery and utilization and verify the analysis with subscale testing. A general system was designed and optimized for the recovery of transformer waste heat. Simplified analytical techniques were developed to assist utilities in both preliminary analysis and detail design analysis of specific systems, including system economics. Critical component performance parameters were identified for the preparation of detailed specifications. Criteria was established for the specific application of such systems through system economics. A national mail survey was conducted to determine the quantity and usability of transformer waste heat in the United States. DOE

N82-12594# Rocket Research Corp., Redmond, Wash.
UTILIZATION OF WASTE HEAT FROM MAJOR TRANSFORMER SUBSTATIONS. VOLUME 2: SITE-SPECIFIC STUDY Final Report
N. T. Christensen Aug. 1981 93 p Sponsored by Electric Power Research Inst. 2 Vol.
(EPRI Proj. 1274-1)
(DE81-904236; EPRI-EM-1968-Vol-2) Avail: NTIS HC A05/MF A01

The applicability of transformer waste heat utilization was examined by analyzing a site-specific application. The site is located in Seattle, Washington; the energy source is the Broad Street Substation and the energy user is the Pacific Science Center. A description of the system is presented in Section I. A preliminary heat source/heat service analysis is given in Section II. Transformer waste heat availability and system heat demand, the thermal performance and hydraulic analysis, overall system efficiency, operation flexibility, major component selection, and the thermal storage system are discussed. The substation site, the transmission system, and the retrofit of the Pacific Science Center are described. System cost details and a cash flow projection are given. DOE

N82-12595# Mid-American Solar Energy Complex, Minneapolis, Minn.
MASEC INDUSTRIAL FUEL-WOOD PROGRAM
M. Hohmann Jul. 1981 46 p refs
(Contract DE-AC02-79CS-30150)
(DE82-000461; MASEC/R-81-062; B-101-3) Avail: NTIS HC A03/MF A01

The program is designed not only to identify technical and institutional barriers to the use of wood for fuel, but to effectively reduce these barriers and the economic uncertainty they cause by providing business and industry with the type of information they need for preliminary planning purposes. Information on resource availability, the types of equipment needed, sources of technical assistance, and the financial aspects of the potential investment are provided. A listing of existing wood-fired systems is also included. A key component of the program is a net-cash-flow analysis based upon a life-cycle economic model that is used to evaluate new and retrofit wood-fired boiler installations. T.M.

N82-12596# Battelle Columbus Labs., Ohio.
ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE AND SEWAGE SLUDGE USING MULTI-SOLID FLUIDIZED BED COMBUSTION TECHNOLOGY
Jul. 1981 210 p refs
(Contract DE-AC01-78CS-20424)
(DE82-001142; DOE/CS-20424/1) Avail: NTIS HC A10/MF A01

The concept is to recover energy as high and low pressure steam, simultaneously. High pressure steam would be generated from flue gas using a conentional tubular boiler. Low pressure steam would be generated by direct contact drying of DSS (as 4 percent solids) with hot sand in a fluidized bed that is an integral part of the MS-FBC process. It is proposed that high pressure steam could be used for district heating or electricity generation. The low pressure steam could be used for close proximity building heat. The results of the investigation show that the MS-FBC process concept for the co-utilization of MSW and DSS is technically feasible and that the thermal efficiency of the process is 76 to 82 percent based on experiments conducted

in a 70 to 85 lb/h pilot plant and calculations on three conceptual cases. DOE

N82-12597# Commission of the European Communities, Luxembourg.
APPLICATION OF DIFFERENT KFA-MODELS IN THE FRAMEWORK OF THE ENERGY RESEARCH PROGRAMME OF THE EUROPEAN COMMUNITIES Final Report
1980 98 p refs
(EUR-6758-EN) Avail: NTIS HC A05/MF A01

Four West German energy models are presented: (1) an energy policy to decrease dependence on oil and gas imports, (2) fuel parameters of various nuclear power plant systems, (3) investments in environmental protection inthe energy sector and their effects on the gross national product, and (4) the use of FORTRAN in modular dynamic simulation. N.W.

N82-12598# Arizona Univ., Tucson. Solar Energy Research Facility.
GUIDEBOOK FOR SOLAR PROCESS-HEAT APPLICATIONS
Rocco Fazzolare, George Mignon, Leonel Campoy, and Francisco Luttmann Jan. 1981 169 p refs
(DE81-027977; DOE/TIC-1027977) Avail: NTIS HC A08/MF A01

The potential for solar process heat in Arizona and some of the general technical aspects of solar, such as insolation, siting, and process analysis are explored. Major aspects of a solar plant design are presented. Collectors, storage, and heat exchange are discussed. Reducing hardware costs to annual dollar benefits is also discussed. Rate of return, cash flow, and payback are discussed as they relate to solar systems. Design analysis procedures are presented. The design cost optimization techniques using a yearly computer simulation of a solar process operation is demonstrated. DOE

N82-12599# International Energy Agency, Paris (France).
OPTIMIZATION OF SOLAR HEATING AND COOLING SYSTEMS
T. L. Freeman (Atlas Corp., Santa Cruz, Calif.) Jun. 1981 56 p refs
(NP-1903997) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

A review of general techniques and specific methods useful in the optimization of solar heating and cooling systems is undertaken. A discussion of the state of the art and the principal problems in both the simplified thermal performance analysis and economic analysis portions of the optimization problem are presented. Sample economic analyses are performed using several widely used economic criteria. The predicted thermal results of one typical, widely used simplified method is compared to detailed simulation results. A methodology for and the results of a sensitivity study of key economic parameters in the life cycle cost method are presented. Finally, a simple graphical optimization technique based on the life cycle cost method is proposed. DOE

N82-12600# Brookhaven National Lab., Upton, N. Y. Technology and Data Div.
COMPARATIVE ECONOMIC PERFORMANCE OF SELECTED PASSIVE SOLAR HEATING AND COOLING TECHNOLOGIES
W. Rutter May 1981 24 p refs
(Contract DE-AC02-76CH-00016)
(DE81-030220; BNL-51394) Avail: NTIS HC A02/MF A01

The economic performance of selected passive solar heating and cooling technologies which incorporate energy storage is assessed by using a set of uniform assumptions and methodologies. Where data are available, a given system is assessed at more than one geographical location. Results are obtained in the form of both payback period and net present value for residential applications, and in terms of net present value only for industrial/commercial uses. Results indicate that ventilated trombe walls, solar roof ponds, and certain night effect/floor storage strategies are cost effective, but night effect/rock bed cooling is not. Results also show that, although direct gain out-performs trombe walls in most parts of the country, both direct gain and trombe walls usually produce a net savings in the residential sector. Generally, however, tax regulations result in net economic loss for direct gain and trombe walls used to heat industrial and commercial buildings. DOE

N82-12601# Sandia Labs., Albuquerque, N. Mex. Thermal Sciences Div.
COMPARATIVE ECONOMICS OF SOLAR THERMAL CENTRAL RECEIVERS
Miriam J. Fish Aug. 1981 56 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029623; SAND-81-8236) Avail: NTIS HC A04/MF A01

For both electrical and industrial process heat (IPH) generation, central receivers compare favorably with oil and gas, and in many cases, coal. Calculational results are presented in which the levelized energy costs from central receiver plants are compared with those from oil, gas, and coal fired plants. Both electrical and IPH applications are discussed. Uncertainties in future capital costs, fuel price escalation rates, and the underlying economic climate are included in the analysis. DOE

N82-12602# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE: EXECUTIVE SUMMARY. VOLUME 1: FOR NEWMAN POWER STATION, EL PASO, TEXAS
Aug. 1981 9 p
(Contract DE-AC04-76DP-00789)
(DE81-031934; SAND-81-7100-Vol-1; MR-14) Avail: NTIS HC A02/MF A01

The data given for a 20 kWp photovoltaic flat panel power system for an uninterruptable power supply load includes: total electrical energy produced during the month of June 1981, and for each day of the month; total incident solar energy in the plane of the collector during the month and for each day of the month; and array efficiency. The monthly average direct normal insolation during the month during daylight hours is also reported. T.M.

N82-12603# Battelle Pacific Northwest Labs., Richland, Wash.
TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS: RESIDENTIAL USE OF FUELWOOD IN THE PACIFIC NORTHWEST
P. N. Petty and W. J. Hopp Aug. 1981 72 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000046; PNL-3918) Avail: NTIS HC A04/MF A01

The evidence of impacts associated with the use of fuelwood for residential space heating in the region including the states of Washington, Oregon, and Idaho is identified and evaluated. The use of fuelwood for space heating was projected into the future, and then the potential size of the impacts that had been identified and estimated was evaluated. These projections are provided in five year increments beginning in 1980 and proceeding to the year 2000. Policy options are suggested which may mitigate the adverse impacts identified, while preserving the positive effect of reducing residential demand for energy derived from nonrenewable sources. DOE

N82-12604# Mid-American Solar Energy Complex, Minneapolis, Minn.
WOOD RESOURCES AND UTILIZATION PATTERNS IN THE NORTH CENTRAL REGION AND ENERGY NEEDS FOR THE MANUFACTURE OF WOOD PRODUCTS
Steven A. Sinclair Mar. 1981 37 p refs
(Contract DE-AC02-79-CS-30150)
(DE81-030356; MASEC/R-81-005) Avail: NTIS HC A03/MF A01

The resources of the region are discussed on a state-by-state basis. The discussion of standing timber growth and removal is in terms of commercial growing stock; however, the total forest biomass may be estimated by simply adding the potential logging residue to the growing stock figure. The energy needs of various wood and paper products, plants, standard industrial classification codes 24 and 26, are highlighted. In addition, the ability of various wood manufacturing facilities to generate their energy needs from wood residues and by-products is explored. T.M.

N82-12605# United Technologies Corp., South Windsor, Conn.
DESIGN, CONSTRUCTION, AND OPERATION OF A FULL SCALE EXPERIMENTAL ANAEROBIC FERMENTATION FACILITY Final Report
Jun. 1981 235 p
(Contract DE-AC01-77ET-20009)
(DE81-029028; DOE/ET-20009/T1) Avail: NTIS HC A11/MF A01

A 25 ton per day anaerobic fermentation facility was designed to evaluate the technical and economic viability of producing fuel gas and an animal refeed product from the residues of an environmental beef cattle feedlot. The system has been in continuous operation and has been producing between 3 to 5 cubic feet of methane per pound of volatile solids fed to the system. Product gas is successfully utilized in: (1) the system process boiler which maintains thermophilic operating temperature in the fermentors; (2) a meat packing plant process boiler, cofired with fuel oil; (3) and a 440 kW grid connected engine/generator system. Feeding trials that will establish the value of the dewatered effluent were performed. It is indicated from the initial operation of the system that it will be a technically and economically viable process. DOE

N82-12606# Argonne National Lab., Ill. Energy and Environmental Systems Div.
TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS: POTENTIAL SOIL EROSION EFFECTS OF HARVESTING CROP RESIDUES FOR ENERGY PRODUCTION
Michael F. Torpy, Loren J. Habegger, Mary A. Snider, and Terrence G. Surles Jan. 1981 38 p refs
(Contract W-31-109-eng-38)
(DE82-000149; ANL/EES-TM-152) Avail: NTIS HC A03/MF A01

An evaluation is presented of the potential increase in erosion that could result from removal of the ground cover that the residues provide. The study indicates that removal of crop residues sufficient to produce 0.13 and 0.42 x 10 to the 15th power Btu of end-use energy (as specified, respectively, in the two scenarios addressed by the Technology Assessment of Solar Energy Program) would have little effect on soil erosion except in a few areas. An alternative scenario is addressed in which all reasonably available crop residues would be harvested to produce 1.5 x 10 to the 15th power Btu of end-use energy. The approach used in evaluating erosion due to removal of residue is also described. DOE

N82-12607# Joint Center for Graduate Study, Richland, Wash.
INVESTIGATION OF SOLAR CELLS BASED ON Cu2 Final Progress Report, 1 Jun. 1980 - 31 May 1981
L. C. Olsen Jul. 1981 50 p refs
(Contract DE-AC02-77CH-00178)
(DE81-030274; SERI/TR-9190-1-T3) Avail: NTIS HC A03/MF A01

Copper oxide solar cells are investigated with emphasis on fabrication of a Cu20 junction with a built-in voltage significantly greater than 1 eV. Substrate fabrication and characterization, and n-type film studies for Cu20 heterojunctions were conducted. A Cu20 cell structure based on T1/Cu20 Schottky barrier is examined. Thick film T1/Cu20 Schottky barriers are analyzed as a function of temperature. Concentration profiles obtained for T1/Cu20 structures with Auger spectroscopy are presented. DOE

N82-12608# Motorola, Inc., Phoenix, Ariz.
PHOTOVOLTAIC MECHANISMS IN POLYCRYSTALLINE THIN FILM SILICON SOLAR CELLS Quarterly Technical Progress Report, 1 Feb. - 30 Apr. 1981
Bhushan Sopori 29 Aug. 1981 43 p refs
(Contract DE-AC02-77CH-00178)
(DE81-030370; DOE/SERI-9234/3; QTPR-3) Avail: NTIS HC A03/MF A01

Efforts are described in developing a technique for rapid identification of isolated line dislocations and dislocation networks in RTR ribbons. This was accomplished by extending the technique of Cu decoration to determine defect propagation in polycrystalline substrates. The basic characteristics of (100) textured surfaces are described, followed by a ray optics approach towards the analysis of textured surfaces, with and without AR coatings. The technique of optimization is demonstrated for a standard cell and an ultraviolet cell. DOE

N82-12609# Massachusetts Inst. of Tech., Cambridge.
PHOTOVOLTAIC MARKET ANALYSIS PROGRAM: BACKGROUND, MODEL DEVELOPMENT, APPLICATIONS AND EXTENSIONS
Gary L. Lilien and Frank H. Fuller Apr. 1981 158 p refs
(Contract DE-AM01-76EI-02295)
(DE81-029711; MIT-EL-81-012) Avail: NTIS HC A08/MF A01

Tools and procedures to help guide government spending decisions associated with stimulating photovoltaic market penetration were developed. The program has three main components: (1) theoretical analysis aimed at understanding qualitatively what general types of policies are likely to be most cost effective in stimulating PV market penetration; (2) operational model developent (PV1), providing a user oriented tool to study quantitatively the relative effectiveness of specific government spending options and (3) field measurements, aimed at providing objective estimates of the parameters used in the diffusion model used in PV1. Existing models of solar technology diffusion are reviewed and the structure of the PV1 model is described. Theoretical results on optimal strategies for spending federal market development and subsidy funds are reviewed. The validity of these results is checked by comparing them with PV1 projections of penetration and cost forecasts for 15 government policy strategies which are simulated on the PV1 model. DOE

N82-12610# Massachusetts Inst. of Tech., Cambridge.
COST GOALS FOR A RESIDENTIAL PHOTOVOLTAIC/THERMAL LIQUID COLLECTOR SYSTEM SET IN THREE NORTHERN LOCATIONS
Thomas L. Dinwoodie and John P. Kavanaugh Oct. 1980 61 p refs
(Contract DE-AC02-76ET-20279)
(DE81-029700; MIT-EL-80-028) Avail: NTIS HC A04/MF A01

The allowable costs for a residential PV/T liquid collector system are compared with those of both PV only and side-by-side PV and thermal collector systems. Four typs of conventional energy systems provide backup: all oil, all gas, all electric resistance, and electric resistance hot water with space heating by parallel heat pump. Electric space cooling is modeled, and the electric utility serves as backup for all electrical needs. The analysis is separated into two parts: (1) a base case study using conservative market and financial parameters for comparing PV/T economics in three northern locations; and (2) the sensitivity of PV/T economics to pertinent physical, market, and financial variables is examined. The difference in economic outlook for PV/T in retrofit applications is also estimated. It is indicated that, it for northern locations modeled, is less than that of separate (side-by-side) collector systems, at total array areas between 40-80 sq m. Below this range, allowable costs diverge, benefiting optimally sized separate collector systems. DOE

N82-12611# Midwest Research Inst., Perth (Australia). Solar Energy Research Inst.
STATUS OF SOLAR ENERGY RESEARCH AND DEVELOPMENT IN AUSTRALIA
Susan G. Saunders May 1981 28 p refs Presented at the Solar Systems Develop. Assoc., Tokyo, 27 May 1981
(NP-1903916; Rept-1007) Avail: NTIS HC A03/MF A01

The solar energy research and development program in Australia is described. Programs with promise of widespread application researched are: (1) solar industrial process heat; (2) solar air conditioning; (3) solar electricity production; and (4) biomass fuels. DOE

N82-12612# Mid-American Solar Energy Complex, Minneapolis, Minn.
SOLAR ENERGY INFORMATION DATA BANK (SEIDB) PROGRAM, FY 1981 Final Project Report
Jun. 1981 24 p
(Contract DE-AC02-79CS-30150)
(DE81-030054; MASEC/R-81-074) Avail: NTIS HC A02/MF A01

The background, program objectives, technical highlights, FY

81 program activity, and recommendations for the SEIDB are reviewed. DOE

N82-12613# Systems Technology Corp., Xenia, Ohio.
CONVERSION OF MUNICIPAL SOLID WASTE TO ENERGY, JACKSONVILLE, FLORIDA, PHASE 1
Jul. 1981 237 p refs
(Contract DE-AC01-79CS-0231)
(DE82-000808; DOE/CS-20231/1) Avail: NTIS HC A11/MF A01

The development of new technology and to foster the commercialization of innovative concepts for energy recovery from municipal solid waste (MSW) was studied. A program to implement the Scientific energy engineering auger combustion system was evaluated. The commercial version of the system, with a capacity of 350 TPD, was developed. The evaluation of applying resource recovery involved the determination of: (1) the amount and characteristics of solid waste; (2) the location and requirement of candidate energy customers and materials markets; (3) the applicable incineration/heat recovery and resource recovery technologies; and (4) the institutional, legal, and environmental requirements for constructing a facility. An implementation plan is developed to define the specific steps required to employ a waste to energy technology. DOE

N82-12614# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
TECHNICAL DATABOOK FOR GEOTHERMAL ENERGY UTILIZATION
S. L. Phillips, A. Igbene, J. A. Fair, H. Ozbek, and M. Tavana Jun. 1981 55 p ref
(Contract W-7405-eng-48)
(DE81-029868; LBL-12810) Avail: NTIS HC A04/MF A01

Selected basic data on aqueous solutions needed to model geothermal energy utilization were surveyed. The data are used for the design and construction of power plants and for direct use. The results are given of the current status of data. The viscosity, thermal conductivity and density of sodium chloride solutions up to 3500 C and 50 MPa are emphasized. An ideal data book for geothermal energy is described. DOE

N82-12615# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
NEAR-TERM IMPROVEMENTS IN PARABOLIC TROUGHS: AN ECONOMIC AND PERFORMANCE ASSESSMENT
R. Gee and L. M. Murphy Aug. 1981 54 p refs
(Contract DE-AC02-77CH-00178)
(DE82-001158; SERI/TR-632-870) Avail: NTIS HC A04/MF A01

Improved parabolic trough concentrating collectors which result from better design, improved fabrication techniques, and the development and utilization of improved materials are analyzed. The improvements considered are evacuated receivers, silvered glass reflectors, improved receiver, selective coatings, higher optical accuracy concentrations, and higher transmittance receiver glazings. Upper bound costs for each improvement are provided as well as estimates of the increased solar system rates of return that are made possible by these improvements. It is shown that the performance and economic potential of these improvements are substantial, especially at higher collector operating temperatures. DOE

N82-12616# Sandia Labs., Albuquerque, N. Mex. Theoretical Div.
USER'S GUIDE TO HELIOS: A COMPUTER PROGRAM FOR MODELING THE OPTICAL BEHAVIOR OF REFLECTING SOLAR CONCENTRATORS. PART 1: INTRODUCTION AND CODE INPUT
C. N. Vittitoe and Frank Biggs Aug. 1981 64 p refs
(Contract DE-AC04-76DP-00789)
(DE81-031920; SAND-81-1180-Pt-1) Avail: NTIS HC A04/MF A01

HELIOS is a flexible computer code for evaluating designs for central receiver, parabolic dish, and other reflecting solar energy collector systems, for safety calculations on the threat to personnel and to the facility itself, for determination of how various input parameters alter the power collected, for design trade offs, and for heliostat evaluations. Input variables include atmospheric transmission effects, reflector shape and surface errors, suntracking errors, focusing and alignment strategies, receiver design, placement positions of the tower and mirrors, and time of day and day of the year for the calculation. Complete input instructions and a description of the code structure are given. DOE

N82-12617# Battelle Pacific Northwest Labs., Richland, Wash.
MANUFACTURING AND COST EVALUATION OF SECOND GENERATION HELIOSTATS. VOLUME 2: APPENDICES
K. Drumheller, P. D. Bondurant, D. R. Brown, and T. A. Williams Sep. 1981 121 p
(Contract DE-AC06-76RL-01830)
(DE82-000232; PNL-3967) Avail: NTIS HC A06/MF A01

Contractor estimated costs were evaluated. Cost comparision sheets and a breakdown of contractor costs are included. T.M.

N82-12618# Sandia Labs., Livermore, Calif. Thermal Sciences Div.
SOLAR THERMAL CENTRAL RECEIVERS FOR INDUSTRIAL PROCESS HEAT GENERATION: USER VIEWS AND RECOMMENDATIONS FOR COMMERCIALIZATION
M. J. Fish Aug. 1981 66 p refs
(Contract DE-AC04-76DP-00789)
(DE81-029611; SAND-81-8235) Avail: NTIS HC A04/MF A01

Results of recent meetings with several private industrial groups in which solar thermal central receivers were discussed in depth as a potential for industrial process heat generation are summarized. Topics covering potential economics, technical requirements, and actions to promote commercialization of the technology are presented. These findings are then translated into recommendations for commercialization in private industrial markets. Key points include the need for small scale systems integration projects in addition to the 10 MW/sub e/ plant under construction at Barstow, CA, and the adoption of financial incentives, such as tax credits, for getting the early commercial plants built. DOE

N82-12619# Oak Ridge National Lab., Tenn.
PRODUCTION OF AMMONIA IN A PACKED-BED, ANAEROBIC UPFLOW (ANFLOW) BIOREACTOR M.S. Thesis - Tennessee Univ.
D. C. M. Hines Aug. 1981 101 p refs
(Contract W-7405-eng-26)
(DE81-030699; ORNL/TM-7622) Avail: NTIS HC A06/MF A01

The objective of this study was to monitor effluent ammonia concentrations and ammonia production rates within the ANFLOW bioreactor as influent soluble chemical oxygen demand (SCOD) concentrations and flow rates were varied. Correlations between influent organic loadings and effluent ammonia concentrations and ammonia formation were sought. Subsequent ammonia removal methods are proposed. A packed-bed, aerobic upflow bioreactor was tested for nitrification of effluent ammonia for the ANFLOW bioreactor. Removal rates of SCOD ranged from 87 to 95 percent within ANFLOW bioreactor. The most efficient SCOD removal occurred at the highest organic loading rate (OLR). Profiles of SCOD and volatile acids concentrations showed distinct regions of complex organics breakdown and wastes stabilization. DOE

N82-12620# Mid-American Solar Energy Complex, Minneapolis, Minn.
INTERACTIVE MODEL TO ASSESS ECONOMICS OF ANAEROBIC DIGESTION OF THE FARM
Aug. 1981 41 p
(Contract DE-AC02-79CS-30150)
(DE82-000452; MASEC/R-81-068) Avail: NTIS HC A03/MF A01

An interactive computer model, to provide economic assessment for on the farm anaerobic digestion systems was designed. The model is accessed as part of the MASEC Models Library. It consists of two phases: engineering analysis and economic analysis. User inputs are stored in a data base and may be retained for future use. Model outputs include a recap of user inputs, calculations for gas production, digester heat requirements, system revenues, yearly cash flow, and a graph

of the net present value of the investment. The model is generalized so that nonfarm applications may also be analyzed. The program will work equally well for various digester designs such as continuously stirred reactors, plug flow systems, and fluidized bed columns. DOE

N82-12621# Gersham, Brickner and Bratton, Inc., Washington, D.C.
WASTE-TO-ENERGY SYSTEMS INSTITUTIONAL BARRIERS ASSESSMENT WORKSHOP
Jun. 1981 57 p Workshop Held in Washington, D.C., 19 Feb. 1981 Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE82-000098; ANL/CNSV-TM-78) Avail: NTIS HC A04/MF A01

Nontechnical institutional barriers affecting implementation of the waste to energy technology, priorization, of identifed barriers, and utilization of information and data to formulate an institutional research plarr, were identified. The following important results are recorded for commercialized and noncommercialized combustor, siting existing laws, multipurisdictional ination, permiles and regulations, and the lack of data on environmental impacts. DOE

N82-12622# Mid-American Solar Energy Complex, Minneapolis, Minn.
VOCATIONAL-TECHNICAL INSTRUCTORS PASSIVE-SOLAR TRAINING WORKSHOP
Jul. 1981 24 p Workshop held in Kansas City, Mo., 1-2 Jun. 1981, Minneapolis, 4-5 Jun. 1981, and Columbus, Ohio, 11-12 Jun. 1981
(Contract DE-AC02-79CS-30150)
(DE81-030055; MASEC/CF-81-019; P-101-7) Avail: NTIS HC A02/MF A01

The successful efforts to provide training to instructors who teach residential design and construction at vocational-technical (vo-tech) schools are described. The training was directed toward those techniques one must consider when designing and/or constructing an energy efficient passive solar home. DOE

N82-12623# Midwest Research Inst., Golden, Colo.
FLEXIBILITIES IN PASSIVE DESIGN: EXAMINING SOME LIMITING SOLAR MYTHS
R. G. Derickson and K. S. Sadlon Jul. 1981 5 p refs Presented at 6th Natl. Passive Conf., Portland, Oreg., 8 Sep. 1981
(Contract DE-AC02-77CH-00178)
(DE81-028401; SERI/TP-721-1342; CONF-810925-15) Avail: NTIS HC A02/MF A01

Frequently cited rules-of-thumb or general guidelines that needlessly limit designer choice and freedom are examined. It is found that a rectangular design with an E-W elongation is not really essential to proper passive design, east and west windows do not necessarily detract from passive heating performance or negatively impact cooling efficiency, and a passive house need not be crammed with thermal mass. Some flexible design alternatives are explored and factors other than E-W elongation, windows, and thermal mass are considered. DOE

N82-12624# Westinghouse Electric Corp., East Pittsburgh, Pa. Advanced Systems Technology Div.
ECONOMIC ASSESSMENT OF ADVANCED CENTRAL-RECEIVER SOLAR-THERMAL POWER SYSTEMS: EXECUTIVE SUMMARY
Oct. 1980 23 p refs
(Contract DE-AC03-79SF-10601)
(DOE/SF-10601/0) Avail: NTIS HC A02/MF A01

The value and potential electric utility impact of several advanced central receiver solar thermal plant concepts in the role of electric generating stations were estimated. Economics, the cost of producing electricity, fuels displaced, and utility system reliability are examined. The central receiver plants evaluated included solar/fossil hybrid concepts and solar stand-alone plants with thermal storage. It is indicated that if the cost goals are achieved and projected solar plant performance attained, the advanced solar thermal concepts can be competitive in regions with good insolation and some continued use of oil or other surrogate distillate or gaseous fuels. DOE

N82-12625# Oak Ridge National Lab., Tenn. Energy Div.
SEASONAL PERFORMANCE FACTORS FOR ACTIVE SOLAR SYSTEMS AND HEAT-PUMP SYSTEMS
R. L. Reid and L. A. Abbatiello 1981 7 p refs Presented at the IECEC Conf., Atlanta, 9 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028569; CONF-810812-35) Avail: NTIS HC A02/MF A01

Methods of evaluating solar systems are discussed and compared. Heating seasonal performance factor (SPFH) and annual coefficient of performance (ACOP) are selected as being of the most vaue to the consumer in determining his purchased energy requirements and also allow the direct comparison of solar and heat pump systems. A search of the literature produced seasonal or annual data from 20 solar and 12 heat pump systems that were instrumented well enough to measure the loads and energy consumptions necessary to calculate the SPFH and/or ACOP. Tables of these results show that well-designed solar systems have SPFHs of 1.6 to 2.8 compared to heat pump SPFHs of 1.6 to 2.0. However, the heat pump Annual Cycle Energy System ACOP was measured as 3.1 compared to a projected maximum ACOP for a solar system with heat pump cooling of 2.4 to 2.8. DOE

N82-12626# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE ANALYSIS OF 11 DENVER METRO PASSIVE HOMES
D. E. Claridge Jul. 1981 7 p refs Presented at the AS/ISES 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-025473; SERI/TP-721-1325; CONF-810925-12) Avail: NTIS HC A02/MF A01

The auxiliary heating requirements for 11 passive solar homes were calculated using SLR or SUNCAT-2.4 with a standard set of basic assumptions. It is shown that: seven of the homes should use less than half as much heating fuel as typical houses, two should use about half, and two should use about two-thirds or more. These results are compared with performance estimates and show large discrepancies. Differences are attributed largely to specific differences in assumptions in every case but one. DOE

N82-12627# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SUMMERTIME RESULTS FROM THE CLASS B PASSIVE-SOLAR PERFORMANCE-MONITORING PROGRAM
J. Swisher Jul. 1981 3 p Presented at the 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-025471; SERI/TP-721-1317; CONF-810925-8) Avail: NTIS HC A02/MF A01

The program is designed to provide, at relatively low cost, accurate and consistent real-time estimates of building thermal performance, as well as detailed data regarding climate, indoor temperatures, and purchased energy needs. As part of this program, a microprocessor-based data acquisition system was installed in each of ten passive solar houses in the Denver area, primarily to evaluate heating-season performance. During the summer, however, the monitoring systems are used to study the overheating tendencies of the buildings. Examination of the conditions that lead to overheating, using graphical and statistical techniques, will provide insight into the solar design practices that provide the most comfortable summer environment. DOE

N82-12628# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR EXPLOSION
B. C. Baccei Apr. 1981 5 p Presented at the 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-026086; SERI/TP-721-1167R; CONF-810925-13) Avail: NTIS HC A02/MF A01

The Solar Energy Research Institute (SERI) and the Department of Energy (DOE) Passive Solar Manufactured Buildings and Solar Home Builders Programs are developing much needed cost and performance data on solar buildings produced by large-volume

home builders. These programs also serve as a model on how government can work effectively with industry. DOE

N82-12629# Los Alamos Scientific Lab., N. Mex.
PASSIVE-SOLAR-RETROFIT STUDY FOR THE UNITED STATES NAVY
William O. Wray and Charles R. Miles (Naval Civil Engineering Lab.) 1981 6 p refs Presented at the 6th Natl. Passive Solar Conf., Portland, Oreg., 8-12 Sep. 1981
(Contract W-7405-eng-36)
(DE81-028921; LA-UR-81-2200; CONF-810925-7) Avail: NTIS HC A02/MF A01

A passive solar retrofit study was conducted to determine the energy savings obtainable in concrete block buildings from several passive solar heating strategies. Test cell data and computer simulation were employed to assess the merits of six retrofit options. The six strategies selected were chosen on the basis of providing a series of options that deliver increasing energy savings at the cost of correspondingly increased levels of commitment. DOE

N82-12630# Los Alamos Scientific Lab., N. Mex.
ECONOMIC IMPLICATIONS OF PASSIVE-SOLAR RETROFIT FOR SINGLE-FAMILY RESIDENCES IN ALBUQUERQUE, NEW MEXICO: A CASE STUDY
S. W. Martin (Public Service Company of New Mexico, Albuquerque) Jun. 1981 125 p refs
(Contract W-7405-eng-36)
(DE81-028402; LA-8892-T) Avail: NTIS HC A06/MF A01

Certain economic criteria are used to evaluate the potential of retrofitted passive solar systems. Actual system and labor costs along with calculated Input-Output income and employment multipliers are used to estimate changes in income and employment levels within the study area. Estimates of changing energy use patterns also are presented. The methodology presented can be expanded to include other technologies and can be used to examine other potential scenarios. DOE

N82-12631# Oak Ridge National Lab., Tenn. Energy Div.
PASSIVE COOLING AND HEATING PROGRAM AT OAK RIDGE NATIONAL LABORATORY FOR FY-1981
H. B. Shapira, S. I. Kaplan, and C. V. Chester 1981 11 p refs Presented at the DOE Passive and Hybrid Solar Energy Program Update, Washington, D.C., 9 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028573; CONF-810832-5) Avail: NTIS HC A02/MF A01

Construction was completed of an earth-sheltered, passively solar heated office-dormitory, the Joint Institute for Heavy Ion Research, designed at ORNL. Instrumentation of the building was designed, procured, and installed. Building performance will be monitored and compared with predictions of the DOE-2 code. A study of the incorporation of vegetation on architecture was conducted by the Harvard School of Design. A final report was issued which is a prototype handbook for the use of vegetation to reduce cooling loads in structures. An experiment to reduce the cooling requirement of mobile homes by shading with fast-growing vines was begun: a maintenance-oriented trellis was constructed and vines were planted. An RFP for the production of a prototype set of reflective insulating blinds was issued.DOE

N82-12632# Sandia Labs., Albuquerque, N. Mex. Div. of Solar Technology.
DEPARTMENT OF ENERGY SOLAR CENTRAL RECEIVER SEMIANNUAL MEETING
Jan. 1981 273 p refs Meeting held in San Francisco, 15-16 Oct., 1980
(Contract DE-AC04-76DP-00789)
(SAND-80-8049; CONF-8010129) Avail: NTIS HC A12/MF A01

The goals and current status of the solar thermal program were reviewed. The organization of the program is discussed, as is funding for fiscal year 1981. Technical progress and future prospects are discussed. T.M.

N82-12633# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
COSTS FOR ALTERNATIVE GRAIN-RESIDUE-COLLECTION SYSTEMS
Silvio J. Flaim, Bernie Neenan, Jan Dauve, and Harry P. Mapp, Jr. (Oklahoma State Univ., Stillwater) Jun. 1981 55 p refs (Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE81-029072; SERI/TR-734-900) Avail: NTIS HC A04/MF A01

The costs for systems for corn and soybean production in Iowa are examined. All machinery field operations, fuel, other inputs, and labor requirements are identified for the base case with no residue harvest, and for residue harvest by stacks and large round bales, with the owner's equipment and for custom harvest. These five cases were developed for corn and soybeans for conventional and reduced tillage practices. Harvesting alternatives are compared on the basis of costs, fuel input requirements, and gross energy balances of residues collected less energy inputs. The cost of collecting corn and soybean residues varies widely over the collection and tillage systems examined. Other effects constant, the reduced tillage practice leads to a lower cost of harvest than conventional tillage, and stacks are always cheaper than large round bales; however, the former difference is greater than the latter. DOE

N82-12634# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INNOVATIVE EQUIPMENT FOR SMALL-SCALE HYDRO DEVELOPMENTS
J. D. Lawrence and Leslie Pereira 1981 17 p refs Presented at the Waterpower Conf., Washington, D.C., 22 Jun. 1981 Prepared in cooperation with Acres American, Inc., Buffalo, N.Y.
(Contract DE-AC07-76ID-01570)
(DE81-027820; EGG-M-03381; CONF-8106137-4) Avail: NTIS HC A02/MF A01

The feasibility of using off the shelf pumps as turbines, with induction motors as generators, and combinations of available equipment such as speed increasers, inlet valves, and gates for typical small scale hydro installations are discussed. A computer simulation model was developed in the study which provides a basis to estimate the performance of pumps in the turbine mode of operation. It is indicated that a major part of the small hydro plant potential can be economically covered by the use of pumps as turbines and induction motors as generators especially for the smaller ratings. DOE

N82-12635# Gilbert Associates, Inc., Reading, Pa.
MODULAR HYDRO DAM APPROACH TO THE ECONOMIC DEVELOPMENT OF ULTRA LOW-HEAD HYDROPOWER
K. R. Broome 1981 19 p Presented at the Hydropower Conf., Washington, D.C., 22 Jun. 1981
(Contract DE-AC07-76ID-01570)
(DE81-027817; CONF-8106137) Avail: NTIS HC A02/MF A01

The potential for developing economical new ultra low head sites using an innovative concept known as the modular hydro dam (MHD) were explored. This concept, combines the benefits of shop fabrication and installation of equipment in truck transportable, waterproof power modules, with prefabricated gate sections that can be located between the power modules. The technical, economic, environmental, and institutional feasibility of the MHD concept are examined. Capital and operating costs are estimated. It is concluded that the potential for power generation at ultralow head sites justifies the development of the MHD concept. DOE

N82-12636# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
DOE SMALL-HYDROPOWER DEMONSTRATION PROGRAM
B. N. Rinehart and L. E. Felton Jun. 1981 15 p refs Presented at Waterpower 1981 Conf., Washington, D.C., 22 Jun. 1981
(Contract DE-AC07-76ID-01570)
(DE81-027819; CONF-8106137-2) Avail: NTIS HC A02/MF A01

Hydroelectric power demonstration projects were developed at small dams. The project methods and results are presented. S.L.

N82-12637# Brookhaven National Lab., Upton, N. Y. Div. of Energy and Economic Analysis.

MODELLING ENERGY-ECONOMIC INTERACTIONS IN DEVELOPING COUNTRIES: A LINEAR-PROGRAMMING APPROACH

Peter Meier and Vinod Mubayi 1981 51 p refs Presented at the 9th Intern. Conf. on Operational Res., Hamburg, 23 Jul. 1981; sponsored by International Federation of Operations Research Societies

(Contract DE-AC02-76CH-00016)

(DE81-026048; BNL-29747; CONF-810726-2) Avail: NTIS HC A04/MF A01

An energy economic assessment model for application to energy assessments in developing countries is described. A simple comprehensive treatment of the energy sector is emphasized. The input output model is directly incorporated in the Energy system LP. The major supply sectors, as well as the major energy using industries, are modelled as capacity expansion problems, in which explicit distinction is made between capital stock and energy flows. For most developing countries the notion of energy supply curves is far fetched, since energy prices are set by planning authority, not established by market clearing equilibrium. DOE

N82-12638# Institut fuer Chemie der Treib- und Explosivstoffe, Pfinztal (West Germany).

LATENT HEAT STORAGE DEVICES. PART 1: CHARACTERISTICS AND APPLICABILITY OF LATENT HEAT STORAGE DEVICES [LATENTWAERMESPEICHER, TEIL 1: EIGENSCHAFTEN UND ANWENDUNGSMOEGLICHKEITEN VON LATENTWAERMESPEICHERN]

K. Krichel Bonn Bundesministerium der Verteidigung 1979 90 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-79-12-Pt-1) Avail: NTIS HC A05/MF A01; DOKZENTBw, Bonn DM 30

Significant physicochemical data (melting point, specific enthalpy of fusion, crystallization kinetics, etc.) on heat storage media and construction materials are recorded. The best storage materials are paraffins, salt hydrates, clathrates, and their mixtures in the lower temperature range (-30 to 100 C), hydroxides and halides of light metals, and their mixtures in the medium temperature range (100 to 500 C), and alkali and alkaline earth halides, especially fluorides at high temperatures (above 500 C). Adaption of different latent heat capacitor designs to operational temperature and storage material, and the relation between heat transport, heat exchanger construction and type of crystallization are discussed. Possible failures caused by unfavorable crystallization kinetics (stratification, supercooling) and measures to avoid such faults are described. Construction and insulation materials, with special emphasis on corrosion and stability, are addressed. Author (ESA)

N82-12639# Institut fuer Chemie der Treib- und Explosivstoffe, Pfinztal (West Germany).

LATENT HEAT STORAGE DEVICES. PART 2: HEAT STORAGE MEDIA, DESIGNS AND CONSTRUCTION MATERIALS FOR HEAT OF FUSION STORAGE DEVICES [LATENTWAERMESPEICHER, TEIL 2: SPEICHERMASSEN, BAUFORMEN UND WERKSTOFFE FUER SCHMELZWAERMESPEICHER]

K. Krichel Bonn Bundesministerium der Verteidigung 1979 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(BMVg-FBWT-79-13-Pt-2) Avail: NTIS HC A04/MF A01; DOKZENTBw, Bonn DM 30

Because of the promising technical and operational advantages of latent heat storage, thermodynamic, kinetic and chemical properties of phase change materials are depicted. Eutectics and conguently melting compounds are the most useful substances among the potentially suitable latent heat storage materials. The operational temperature depending on the phase change material remains constant at charge and discharge. Melting is the most appropriate phase change for heat storage due to considerable heat capacities and high densities of condensed phases. Supercooling of many storage media is at present a considerable difficulty. Besides the treatment of economics, safety hazards and environmental problems and the description of some practical applications, two suggestions for military applications of latent heat storage devices are discussed. Author (ESA)

N82-12640# Nationale Raad voor Landbouwkundig Onderzoek TNO, The Hague (Netherlands).

BASIS FOR RESEARCH PROPOSALS CONCERNING (INDUSTRIAL) SOLAR ENERGY PRODUCTION PROCESSES DERIVED FROM BIOLOGICAL PRINCIPLES [BASIS VOOR ONDERZOEKVOORSTELLEN BETREFFENDE (INDUSTRIEELE) ZONNE-ENERGIEWINNINGSPROCESSEN AFGELEID VAN BIOLOGISCHE PRINCIPES]

1980 96 p refs In DUTCH

Avail: NTIS HC A05/MF A01

The economic feasibility of photochemical conversion systems for solar energy production processes derived from biological principles was studied. A global energy analysis shows that the period during which a solar energy installation has to deliver energy in order to regain the energy required for the construction is about one-seventh or one-eighth of its lifetime (10 times longer than conventional installations). Energy production with the help of photocatalytic systems in western Europe is only economical if the net conversion efficiency is substantially increased above 15%. Complex photocatalytic processes or combined photoelectric, photochemical and thermal mechanisms may be applied, i.e., coproduction, combining a photovoltaic or photocatalytic process with solar heat production or combining several photocatalytic systems. A tentative evaluation of conversion processes for solar energy is presented. Author (ESA)

N82-12641# Audi NSU Auto Union A.G., Neckarsulm (West Germany). Entwicklung Neckarsulm.

FUEL SAVINGS IN HOT WATER HEATING PLANTS BY APPLICATION OF HEAT PUMPS OPERATED WITH NATURAL GAS (NATURAL GAS HEAT PUMP). PROJECT: GAS ENGINE Final Report

Klaus Wissler Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-125; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,60

Energy consumption in residential heating using a heat pump driven by an internal combustion engine is discussed. A natural gas rotary engine was developed as a drive unit for a heat pump with 120 to 150 kW heating capacity. The engine was derived from an automotive prototype engine; it had an output of 50 kW at 6000 rpm. The efficiency was improved by an increased compression ratio and a rotor recess suitable for natural gas operation. The engine used specially developed spark plugs and high performance lubrication oil. To obtain longevity, the trochoid surface and the side housing surface were coated with a plasma spray wear coating, ceramic apex seals were used and the accessories were redesigned. Author (ESA)

N82-12642# Ludwig-Maximilians-Universitaet, Munich (West Germany). Inst. fuer Experimentalphysik.

IMPROVEMENT OF THERMAL EFFICIENCY OF FLAT PLATE SOLAR COLLECTORS Final Report

Hubert Boeck, Reinhard Hallermayer, Wolfgang Schoelkopf, and Alfred Wiesmeth Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 62 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-194; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Measuring methods (spectral resolution of absorptivity and the evaluation of overall absorptivity with a solar spectrum) and further developed (calorimetric device to measure the hemispherical thermal emissivity of various speciments) were examined. The convective heat transfer between cover and absorber of a flat plate collector is partially suppressed by various inserted structures. The optical transmission of the cover of flat plate collectors is improved by interference layers. Thus an improvement is important when a correct azimuthal orientation of the collector is impossible. Results of an experimental comparative test of several commercial flat plate collectors are presented.

Author (ESA)

N82-12643# Varta Aktiengesellschaft Forschungs- und Entwicklungszentrum, Kelkheim (West Germany).
GALVANIC HIGH ENERGY CELLS WITH MOLTEN SALT ELECTROLYTES Final Report
Waldemar Borger, Wolfgang Kappus, Dieter Kunze, Helmut Laig-Hoerstebrock, Harbans Panesar, and Gerhard Sterr Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 126 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-048; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,60

Engineering scale LiAl/LiCl KcI/FeS electrochemical storage cells were developed for electric vehicle propulsion and peak current compensation. More than 300 deep cycles and 50 Whr/kg in 100 Ahr cells and up to 100 deep cycles and more than 80 Whr/kg in 200 Ahr cells were demonstrated. Separator development for LiAl/FeS cells was focused on ceramic powders. The aluminum nitride powder separator is promising for LiAl/FeS cells. The further development of these cells includes the enhancement of energy density and lifetime as well as ceramic powder separators. Author (ESA)

N82-12644# Technical Research Centre of Finland, Espoo. LVI-Tekniikan Lab.
THE PROPERTIES OF SOLAR AND HEAT PUMP HEATING SYSTEMS OF SMALL HOUSES AND ADDITIONAL HEAT SOURCES
Tino Kalema and Kari Wellman Apr. 1981 121 p refs In FINNISH; ENGLISH summary
(VTT-56; ISBN-951-38-1199-9; ISSN-0355-3469; RISO-M2241) Avail: NTIS HC A06/MF A01

The active use of solar energy in heating of small houses was studied with a computer program developed for this purpose. The calculations clear up the thermal properties of seven solar and heat pump systems with different operational principles. The following topics are studied: (1) how much energy is obtained from different heat sources (basic heat source, solar radiation, earth and wood); and (2) the influence of collector size, structure, and storage on the energy obtained from the collector in each system. The influence of the size and depth of the heat pump Earth pipes on compressor electricity consumption, Earth temperatures and freezing are also studied. Author (ESA)

N82-12645# Joint Publications Research Service, Arlington, Va
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, NO. 72
1 Sep. 1981 49 p Transl. into ENGLISH from various West European articles
(JPRS-78876) Avail: NTIS HC A03/MF A01

The production and mechanical properties of thermoplastic sheets reinforced with long glass fibers, the design and operation of a solar receiver in Spain, and the aerodynamic characteristics of a vertical axis wind turbine operating in Patogonia are described. For individual titles, see N82-12646 through N82-12648.

N82-12646# Joint Publications Research Service, Arlington, Va.
GLASS-MAT-REINFORCED THERMOPLASTIC: STRONG, EASY TO WORK **c27**
Martin Welz, Erkhard Siler, and Hartmut Schriever *In its* W. Europe Rept.: Sci. and Technol., No. 72 (JPRS-78876) 1 Sep. 1981 p 1-14 Transl. into ENGLISH from Tech. Rundschau (Bern), 2 Jun. 1981 p 33 and 35 (For primary document see N82-12645 03-44)
Avail: NTIS HC A03/MF A01

By means of the specifically oriented optimization of glass mats and matrix materials, it is possible to make semifinished products with adjusted shaping and flow performance. Semifinished product manufacturing is accomplished continually through the broad slit extrusion of the thermoplastic material. The soaking of the glass fibers with the polymer melt is performed by means of special process engineering measures so that a uniform distribution of the glass fibers is achieved in the plate along with intensive crosslinking with the polymers, without any noticeable air inclusions. Various coatings can be applied, such as metal foils and synthetic leathers. In contrast to hardenable semifinished products, the glass mat thermoplastics can be stored in an unlimited manner as semifinished materials. The mechanical properties of a polypropylene containing about 30% long glass fibers are compared with those of a steel plate and with SMC containing about 30% glass fibers. A.R.H.

N82-12647# Joint Publications Research Service, Arlington, Va.
SOLAR PROJECT AT ALMERIA NEARS COMPLETION
Hans Fricker *In its* W. Europe Rept.: Sci. and Technol., No. 72 (JPRS-78876) 1 Sep. 1981 p 15-17 Transl. into ENGLISH from Chem. Rundschau (Zurich), 25 May 1981 p 3 and 5 (For primary document see N82-12645 03-44)
Avail: NTIS HC A03/MF A01

Ninety-three mirrors (heliostats), steered by a computer, reflect the sunlight at all times of the day and year into the opening of a combustion chamber (receiver) mounted on a 43-meter high tower in southern Spain. The cooling medium, liquid sodium, is heated from 270 C to 530 C, after which it flows to the hot storage tank installed on the ground below. As needed, sodium can be circulated out of the tank through the steam generator into a cold storage tank and from there back to be reheated in the receiver. The steam created in the steam generator expands in a steam engine; the mechanical energy created there drives the 500 kW generator, which produces the electric power. The selection of sodium as the cooling medium, and the design of the receiver and the pressure relief system which guarantees the safety of the plant in the unlikely event of a steam pipe bursting are described. A.R.H.

N82-12648# Joint Publications Research Service, Arlington, Va.
GERMAN-ARGENTINE EXPERIMENT: VERTICAL-ROTOR WIND ENGINE
Peter Raabe *In its* W. Europe Rept.: Sci. and Technol., No. 72 (JPRS-78876) 1 Sep. 1981 p 18-19 Transl. into ENGLISH from Tagesspiegel (Berlin), 4 Jul. 1981 p 12 (For primary document see N82-12645 03-44)
Avail: NTIS HC A03/MF A01

Designed by aerodynamists, a wind motor built in Patagonia, is independent of the direction of the wind due to its vertical rotating axis. The narrow rotor blades have optimum aerodynamic efficiency. Drum-like wind collectors at the top and bottom of the rotating axis serve as starters. The plant incorporates simple instead of sophisticated mechanical parts, and its maintenance requirements are extremely low. Only the two rotating bearings located at the top and bottom of the axis require lubrication, with the oil being changed only twice a year. A.R.H.

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-12649 California Univ., Los Angeles.
DEVELOPMENT OF A MARINE MONITORING PROGRAM IN CALIFORNIA Ph.D. Thesis
Francis Henry Palmer, Jr. 1981 135 p
Avail: Univ. Microfilms Order No. 8121025

The development of a monitoring program for coastal and estuarine waters of California is described. A monitoring system was developed to provide a technical example of applying research findings to the establishment of a monitoring program and to give some independent, evaluative observations on the approach of the Water Resources Control board to supporting research investigations. A mussel watch concept of monitoring is based on using a marine organism, the mussel, as a sampling device. Locations where indigenous mussels bear elevated tissue levels of trace metal, petroleum hydrocarbons, and chlorinated hydrocarbons in comparison to other locations are identified. A research investigation is designed to examine the biological effects of observed elevated levels upon the organisms. Dissert. Abstr.

N82-12650 California Univ., Los Angeles.
A COMPUTER SIMULATION MODELING STUDY TO PREDICT AIR QUALITY IMPACTS FROM A 500 MW

COAL-FIRED POWER PLANT Ph.D. Thesis
Gary Van Jandegian 1981 255 p
Avail: Univ. Microfilms Order No. 8120979

A computer simulation modeling study was conducted to predict sulfur dioxide ambient air quality impacts resulting from the operation of a 500 megawatt coal-fired power plant expansion in the Trombay area of Bombay, India. The AQUAL, a multiple source Gaussian plume dispersion model employs diffusion coefficients and plume rise equations and predicts maximum and average 3 hour and 24 hour ground level pollutant concentrations for up to 250 receptor points within 20 kilometers of a power plant stack(s). Results of the modeling exercises are used to recommend proper SO2 controls such as flue gas desulfurization, fuel switching to low sulfur oil and natural gas, etc. Dissert. Abstr.

N82-12651 Natural Environment Research Council, London (England).
POLICY AND SUPPORT FOR RESEARCH IN MARINE LIFE SCIENCES
Hermann Bondi Sep. 1981 12 p
Copyright. Avail: Issuing Activity

The marine biological research effort is considered under a number of research headings: open ocean ecosystems, coastal and estuarine ecosystems, shores and marginal areas, southern ocean ecosystem, biological function, and marine mammals. The shifting emphasis in NERC's ecological research away from description based on the traditional survey type approach, towards studies in field and laboratory aimed at elucidating the fundamental processes that govern the behavior of estuarine, coastal, and open sea ecosystems, is highlighted. T.M.

N82-12652 Washington Univ., Seattle.
BENEFIT-COST ANALYSIS WITH UNCERTAIN INFORMATION: AN APPLICATION IN AIR POLLUTION CONTROL Ph.D. Thesis
Michael Gordon Ruby 1981 196 p
Avail: Univ. Microfilms Order No. 8121241

A form of the net present value decision rule for evaluating the economic advisability of policies and projects was developed and demonstrated. It discounts future benefits and costs at the social rate of time preference but accounts for the lost opportunity costs of the higher returns available to private investments. The uncertainties in the resulting calculations, due to inadequate data, for an air pollution control project at a model stationary source of sulfur dioxide air emissions were examined. Each of the variables in the rule for both a meso-scale and a long-range transport case at three levels of background pollutant concentrations were examined. Estimates are given for both the dominance of the variables at specific nominal values and the uncertainty in the individual terms. Dissert. Abstr.

N82-12653# General Accounting Office, Washington, D. C.
SOLID WASTE DISPOSAL PRACTICES: OPEN DUMPS NOT IDENTIFIED. STATES FACE FUNDING PROBLEMS Report to the Honorable Albert Gore, Jr., House of Representatives
23 Jul. 1981 53 p
(CED-81-131) Avail: NTIS HC A04/MF A01

The problems of disposal and treatment of solid wastes from industrial, commercial, and residential sources are reported. The municipal waste and disposal facilities receive household wastes, medical wastes, paints, pesticides, dead animals, metals, plastics, and liquid chemical wastes. Many facilities are located on land that has little or no value for other uses, which poses the greatest potential for environmental damage, surface water and ground water contamination. Sanitary landfilling is a method of disposing of solid waste with only minimal damage to the environment and poses no hazard to public health or safety. Solid waste is also disposed on land through: surface impoundments (lagoons, pits, and ponds) for liquid wastes, and landspreading of sewage, industrial, and other sludges. Incineration and various resource recovery techniques are used to process waste. In is concluded that each of these processes results in a residue which must still be disposed of on the land. Suggestions for improved waste disposal are presented. E.A.K.

N82-12654*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF ACTIVITY INTERFERENCE ON ANNOYANCE DUE TO AIRCRAFT NOISE
Kelli F. Willshire and Clemens A. Powell Nov. 1981 29 p refs
(NASA-TP-1938; L-14808) Avail: NTIS HC A03/MF A01 CSCL 13B

The effects of aircraft flyover noise on annoyance were compared for face to face conversation, reverie, and television viewing. Eighteen 5 minute sessions, each composed of three flyovers, were presented on each of 2 days to subjects in a simulated living room. Twelve pairs of females and 12 pairs of males were tested, once before and once after work. Flyovers varied in peak noise level from 53 to 83 dB, A weighted. On each day, subjects engaged in 18 sessions, six of conversation, six of television viewing, and six of reverie. The subjects completed subjective ratings of annoyance and acceptability following every session. Annoyance and unacceptability rating scores were significantly higher for the activity of television viewing compared to conversation or reverie. There was no difference between judgments during the latter two activities. No differences were found in the judgments when compared on the basis of 'fatigue' (before/after work) or sex of the subject. Author

N82-12655*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CALIBRATION OF A TURBIDITY METER FOR MAKING ESTIMATES OF TOTAL SUSPENDED SOLIDS CONCENTRATIONS AND BEAM ATTENUATION COEFFICIENTS IN FIELD EXPERIMENTS
J. W. Usry and C. H. Whitlock Oct. 1981 17 p refs
(NASA-TM-81873) Avail: NTIS HC A02/MF A01 CSCL 13B

Management of water resources such as a reservoir requires using analytical models which describe such parameters as the suspended sediment field. To select or develop an appropriate model requires making many measurements to describe the distribution of this parameter in the water column. One potential method for making those measurements expeditiously is to measure light transmission or turbidity and relate that parameter to total suspended solids concentrations. An instrument which may be used for this purpose was calibrated by generating curves of transmission measurements plotted against measured values of total suspended solids concentrations and beam attenuation coefficients. Results of these experiments indicate that field measurements made with this instrument using curves generated in this study should correlate with total suspended solids concentrations and beam attenuation coefficients in the water column within 20 percent. T.M.

N82-12656*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PASSIVE OPTICAL SAMPLE ASSEMBLY (POSA) Final Report
Roger C. Linton, Edgar R. Miller, and Michael Susko Aug. 1981 47 p refs
(NASA-TM-82446) Avail: NTIS HC A03/MF A01 CSCL 13B

A Passive Optical Sample Assembly (POSA) unit was mounted and flown in the cargo bay of the space shuttle Columbia during the first Orbital Flight Test (OFT-1). A similar unit was mounted in a different location in the cargo bay during the postflight operations. The samples in both POSA arrays were subjected to a series of optical and analytical measurements prior to delivery for installation in the cargo bay and after retrieval of the flight hardware. The final results of a comparison of the two series of measurements are presented. These STS-1 results are based on data obtained from only a portion of one of the ten Induced Environment Contamination Monitor instruments to be flown on several shuttle flights beginning with STS-2. These limited results do not indicate shuttle contamination levels in excess of those anticipated. J.M.S.

N82-12657*# Mechanical Technology, Inc., Latham, N. Y.
ELECTRIC AND HYBRID VEHICLES ENVIRONMENTAL CONTROL SUBSYSTEM STUDY Final Technical Report
15 May 1981 288 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955682)

(NASA-CR-164995; JPL-9950-570; MTI-81TR36) Avail: NTIS HC A13/MF A01 CSCL 13B

An environmental control subsystem (ECS) in the passenger compartment of electric and hybrid vehicles is studied. Various methods of obtaining the desired temperature control for the battery pack is also studied. The functional requirements of ECS equipment is defined. Following categorization by methodology, technology availability and risk, all viable ECS concepts are evaluated. Each is assessed independently for benefits versus risk, as well as for its feasibility to short, intermediate and long term product development. Selection of the preferred concept is made against these requirements, as well as the study's major goal of providing safe, highly efficient and thermally confortable ECS equipment. S.L.

N82-12658*# TRW, Inc., McLean, Va. Energy Systems Planning Div.

ELECTRIC AND HYBRID VEHICLE ENVIRONMENTAL CONTROL SUBSYSTEM STUDY Final Report

Kenneth L. Heitner 4 Dec. 1980 198 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955683)

(NASA-CR-164996; JPL-9950-569; Rept-97649-E005-UX-02) Avail: NTIS HC A09/MF A01 CSCL 13B

An environmental control subsystem (ECS) in electric and hybrid vehicles is studied. A combination of a combustion heater and gasoline engine (Otto cycle) driven vapor compression air conditioner is selected. The combustion heater, the small gasoline engine, and the vapor compression air conditioner are commercially available. These technologies have good cost and performance characteristics. The cost for this ECS is relatively close to the cost of current ECS's. Its effect on the vehicle's propulsion battery is minimal and the ECS size and weight do not have significant impact on the vehicle's range. S.L.

N82-12659# California Univ., Berkeley. School of Public Health.

DEVELOPMENT OF AN AIR SAMPLING AND ANALYTICAL METHOD FOR 1,6-HEXAMETHYLENE DIISOCYANATE Final Report

Stephen M. Rappaport 10 Jul. 1981 34 p refs

(Grant AF-AFOSR-0113-80; AF Proj. 2312)

(AD-A105002; AFOSR-81-0666TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

A preliminary evaluation of a new air sampling and analytical procedure for 1,6-hexamethylenediisocyanate (HDI) is given. Airborne HDI is trapped by drawing air through a filter which had been impregnated with 1-naphthylenemethylamine (NMA) HDI and NMA react on the filter surface to form the stable urea, HDI-NMA, which quantified by HPLC. A novel procedure is presented for separating HDI-NMA from NMA during analysis. GRA

N82-12660# Aerospace Corp., Germantown, Md.

ENERGY TECHNOLOGIES AND THE ENVIRONMENT. ENVIRONMENTAL INFORMATION HANDBOOK

Jun. 1981 515 p refs

(Contract DE-AT03-76EV-74010)

(DE81-029809; DOE/EP-0026) Avail: NTIS HC A22/MF A01

Information on the environmental consequences of energy technologies that will be in use during the next 20 years are reviewed. Information on environmental issues, control technologies, and energy production and conservation processes is discussed. References are given for the statements, data, and conclusions. Environmental aspects of energy technologies and references that can be relied upon through changing policies and changing world energy prices are presented. DOE

N82-12661# Bioassay Systems Corp., Woburn, Mass.

DEVELOPMENT OF TESTING PROCEDURES AND BIBLIOGRAPHIC INFORMATION RELEVANT TO THE TESTING OF SOLID WASTES RESULTING FROM SYNTHETIC FUELS PRODUCTION Progress Report, 1 Apr. - 30 Jun. 1981

J. M. Smith and D. M. Hanson Jun. 1981 17 p refs

(Contract DE-AC22-80PC-30098)

(DE81-030822; DOE/PC-30098/T2) Avail: NTIS HC A02/MF A01

The data tables outlining which bioassay procedures were applied to various synfuel wastes were finalized. Justification for each of the assays (Health and Ecological Effects) proposed in the test battery were written. In addition, the extraction and assay schedules were developed for Task 3. DOE

N82-12662# Battelle Pacific Northwest Labs., Richland, Wash.

TREATMENT OF BIOMASS-GASIFICATION WASTEWATERS USING LIQUID-LIQUID EXTRACTION

N. E. Bell Sep. 1981 28 p refs

(Contract DE-AC06-76RL-01830)

(DE82-000711; PNL-4016) Avail: NTIS HC A03/MF A01

Distribution coefficients for chemical oxygen demand (COD) removal were determined for the following solvents: methylisobutyl ketone (MIBK), n-butyl acetate, n-butanol, MIBK/n-butyl acetate (50:50 vol), MIBK/n-butanol (50:50 vol), tri-butyl phosphate, tri-n-octyl phosphine oxide (TOPO)/MIBK (10:90 wt), TOPO/kerosene (10:90 wt), kerosene, and toluene. The best distribution coefficient of 1.3 was given by n-butanol. Chemical analysis of the wastewater by gas chromatography (GC) showed acetic acid and propionic acid concentrations of about 4000 mg/1. Methanol, ethanol, and acetone were identified in trace amounts. These five compounds accounted for 45 percent of the measured COD of 29,000 mg/1. DOE

N82-12663# Battelle Pacific Northwest Labs., Richland, Wash.

COMBUSTION: AN OIL SPILL MITIGATION TOOL. PHASE 2: THE BURNING OF THE M/T BURMAH AGATE (EX-DANALAND)

J. L. Goodier and R. J. Siclari Aug. 1981 134 p refs

(Contract DE-AC06-76RL-01830)

(DE82-000527; DOE/TIC-11471) Avail: NTIS HC A07/MF A01

A major marine casualty off the coast of Galveston, Texas is described. When two vessels collided, both caught fire and the tanker Burmah Agate burned for 69 days with extensive loss of life. Research directed towards burning an oil cargo in a stricken tanker was studied as a means of reducing the release of oil to the environment to protect the natural resources of the coastline from damage from oil. T.M.

N82-12664# California Univ., Livermore. Lawrence Livermore Lab. Environmental Sciences Div.

USER MANUAL FOR SILVA: A COMPUTER CODE FOR ESTIMATING EFFECTS OF POLLUTION ON THE GROWTH AND SUCCESSION OF WESTERN CONIFEROUS FORESTS

M. C. Axelrod and J. R. Kercher 1981 79 p refs Sponsored in part by EPA

(Contracts W-7405-eng-48; DI-FWS-14-16-009-78-969)

(DE82-000134; UCID-18594-Rev-1) Avail: NTIS HC A05/MF A01

A computer code (SILVA) developed for simulating impacts of SO2 pollution on the growth and succession of western coniferous forests was specifically parameterized for application to the Ponderosa pine and mixed conifer forests of the Sierra Nevada, California. A code (JABOWA) for simulating northeastern USA forests, was used as a framework for SILVA. This user maual describes sample inputs: code structure; data, dynamic control, and internal variables; sample output; and considerations for setup at the user's computer installation. A listing of the souce program and descriptions of all subroutines and functions are presented. DOE

N82-12665# Sandia Labs., Albuquerque, N. Mex. Environmental Research Div.

LAGRANGIAN MEASUREMENTS OF SULFUR DIOXIDE TO SULFATE CONVERSION RATES

B. D. Zak May 1981 38 p refs

(Contract DE-AC04-76DP-00789)

(DE82-000246; SAND-80-2175) Avail: NTIS HC A03/MF A01

On the basis of project MISTT data and proposed homogeneous gas phase oxidation mechanisms for sulfur dioxide, it is suggested that the degree of mixing with background air, the chemical composition of the background air, and the intensity of the sunlight available are key factors determining the rate of sulfur dioxide to sulfate conversion. These hypotheses were

examined in light of Lagrangian measurements of conversion rates in power plant plumes. It is found that the Lagrangian conversion rate measurements are consistent with these hypotheses. T.M.

N82-12666# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environmental Div.
ENVIRONMENAL POLLUTANT STUDIES, FY 1980 Annual Report
Feb. 1981 55 p refs
(Contract W-7405-eng-48)
(DE81-028051; LBL-11986) Avail: NTIS HC A04/MF A01

Separate abstracts were prepared for the 16 papers presented in this annual report of the Energy and Environment Division. Among the topics discussed are the following: atmospheric aerosol project, membrane bioenergies research, and lake ecotoxicology research. DOE

N82-12667# Energy and Environmental Analysis, Inc., Arlington, Va.
IMPACT OF FUEL-ECONOMY SHORTFALL: TRENDS IN TECHNOLOGY-WEIGHTED EPA VERSUS ON-ROAD MPG. PERIODIC ANALYSIS MEMORANDUM NO. 1
1 Apr. 1981 23 p refs
(Contract DE-AC01-79PE-70032)
(DE81-030841; DOE/PE-70032/T1) Avail: NTIS HC A02/MF A01

The fuel consumption impacts of revised estimates of the shortfall between the EPA-measured and on-road fuel economy of light-duty vehicles (passenger cars and light-duty trucks less than 8500 lbs GVW) are examined. The analysis uses the DOE Highway Fuel Consumption model to project fuel demand. The technologies and technology-specific shortfall relations are examined. The procedure used to develop aggregate technology-weighted fuel economy shortfall relations for the Highway Fuel Consumption model is outlined. The fuel demand impacts of alternative assumptions regarding technology-specific shortfall are compared. DOE

N82-12668# Sandia Labs., Albuquerque, N. Mex.
GUIDANCE FOR IMPLEMENTING AN ENVIRONMENTAL, SAFETY AND HEALTH ASSURANCE PROGRAM. VOLUME 12: MODEL GUIDELINES FOR LINE ORGANIZATION ENVIRONMENTAL, SAFETY AND HEALTH INSPECTION AND MONITORING ACTIVITIES
A. C. Ellingson Aug. 1981 44 p refs
(Contract DE-AC04-76DP-00789)
(DE81-030991; SAND-81-0643) Avail: NTIS HC A03/MF A01

The implementation of environmental safety and health (ES and H) assurance program is reported. The standard which specifies that the operational level of an institution must have internal control and assurance functions is discussed. Guidance for the inspection and monitoring activities which are a very basic part of assurance functions are provided. DOE

N82-12669# Sandia Labs., Albuquerque, N. Mex.
GUIDANCE FOR IMPLEMENTING AN ENVIRONMENTAL, SAFETY AND HEALTH ASSURANCE PROGRAM. VOLUME 13: MODEL GUIDELINES FOR LINE ORGANIZATION ENVIRONMENTAL, SAFETY AND HEALTH MEETINGS
A. C. Ellingson Aug. 1981 38 p refs
(Contract DE-AC04-76DP-00789)
(DE81-030980; SAND-81-0644) Avail: NTIS HC A03/MF A01

The implementation of environmental safety and health (ES and H) assurance program is described. The participation by and feedback from employees in ES and H matters is stressed. It is shown how ES and H meetings are used as a framework for employee involvement in the ES and H program. It is found that involvement is essential for defining the acceptability of ES and H controls from an employee's perspective. DOE

N82-12670# Florida State Univ., Tallahassee. Inst. of Molecular Biophysics.
IMPACT OF ENERGY-RELATED POLLUTANTS ON CHROMOSOME STRUCTURE Progress Report, 1 Jan. - 31 Dec. 1981
Randolph L. Rill 1981 11 p
(Contract DE-AS05-78EV-05888)
(DE82-000153; DOE/EV-05888/4) Avail: NTIS HC A02/MF A01

Products of reactions of deoxyribonucleosides with diethylsulfate and ethyl methanesulfonate in neutral aqueous solution and in DMSO, and with ethyl iodide in DMSO, were separated and quantitiated by reverse phase PHLC. Aqueous reactions yielded small, but significant, amounts of nucleosides modified at exocyclic positions. Several unidentified derivatives not previously reported were found. A method for resolving all known ethylated deoxyribonucleotides was developed. The covalent coupling of ethidium monoazide to DNA alone and DNA in chromatin was examined. Covalently bound ethidium preferentially bound to DNA recovered in subnucleosomes. The amount of covalently bound ethidium recovered in mononucleosomes decreased with increasing nuclease digestion, suggesting that nucleosomes most susceptible to nuclease attack preferentially bind ethidium. DOE

N82-12671# Aerospace Corp., Germantown, Md.
TECHNOLOGY CHARACTERIZATIONS: ENVIRONMENTAL INFORMATION HANDBOOK, SECOND EDITION
Jun. 1981 340 p refs
(Contracts DE-AT03-76EV-74010; DE-AC01-81EV-10450)
(DE81-029993; DOE/EP-0028) Avail: NTIS HC A15/MF A01

Environmental characterization information for a range of energy supply systems is presented. Environmental residuals and physical resource requirements are the principal information provided. The specific energy technologies included are nuclear, petroleum, natural gas, synthetic fuels, coal, solar, geothermal, and hydroelectric. Each technology is characterized in terms of the resources required, costs, residuals released, energy products, and occupational safety and health data. The information is based on a facility of particular size and design, with the data presented on the basis of annual quantities or total facility lifetime quantities (e.g., construction materials), as appropriate. In addition, the data are normalized to 1 trillion Btu energy output to facilitate cross technology comparison and use of the data in computerized data bases. DOE

N82-12672# Oregon State Univ., Newport. Marine Science Center.
BIOGEOCHEMICAL STUDIES OF TECHNETIUM IN MARINE AND ESTUARINE ECOSYSTEMS Progress Report, 1 Jul. 1980 - 31 Jul. 1981
T. M. Beasley 1981 76 p refs
(Contracts DE-AM06-76RL-02227; DE-AT06-79EV-10251)
(DE81-030325; DOE/EV-10251/3) Avail: NTIS HC A05/MF A01

Progress from July 1980 through July 1981 on studies dealing with the biogeochemical behavior of technetium in marine and estuarine ecosystems is reported. The results of experiments have substantially extended understanding of the environmental behavior of Tc (principally as $TcO(+4)$. DOE

N82-12673# Bioassay Systems Corp., Woburn, Mass.
DEVELOPMENT OF TESTING PROCEDURES AND BIBLIOGRAPHIC INFORMATION RELEVANT TO THE TESTING OF SOLID WASTES RESULTING FROM SYNTHETIC-FUELS PRODUCTION Technical Progress Report, 30 Dec. 1980 - 31 Mar. 1981
James M. Smith and Douglas M. Hanson Mar. 1981 25 p refs
(Contract DE-AC22-80PC-30098)
(DE81-030671; DOE/PC-30098/T1) Avail: NTIS HC A02/MF A01

A bibliography containing over 80 references on material pertinent to the biological testing of snyfuel products is presented along with a compedium of information on bioassays performed on all synfuel materials within the last ten years. A sample preparation procedure useful in extracting substances for bioassay testing and a bioassay test battery suitable for testing synfuel solid wastes are described. DOE

N82-12674# Oak Ridge National Lab., Tenn. Chemical Technology Div.

KINETICS OF WET OXIDATION OF BIOLOGICAL SLUDGES FROM COAL-CONVERSION WASTEWATER TREATMENT
R. K. Helling, M. K. Strobel, and R. J. Torres Sep. 1981 55 p refs
(Contract W-7405-eng-26)
(DE82-000525; ORNL/MIT-332) Avail: NTIS HC A04/MF A01

Combustible organics in aqueous solutions or suspensions, which are characteristic of waste aqueous solutions or suspensions, which are characteristics of waste treatment effluent from coal liquefaction, may be treatable by wet oxidation. The wet oxidation of model compounds (phenol in water or phenol in municipal waste sludge) in a batch autoclave reactor was found to proceed rapidly to 99% conversion in less than 15 min for temperatures between 185 and 2300C, oxygen pressures between 2000 and 1300 psig, and initial phenol concentrations of 2.5, 10, and 50 g/L. The reaction occurs in three phases: a slow induction period, a fast first-order reaction with a low activation energy of 4.9 kcal/gmol, followed by a slow first-order reaction. During the reaction a variety of colored intermediates (catechol, succinic acid, hydroquinine) form. It is postulated that the fast portion of the reaction sequence follows free-radical mechanism. DOE

N82-12675# Zawadzki (Edward A.) Ltd., McMurray, Pa.
PRELIMINARY STUDY: USE OF LOW-SULFUR COAL AND COAL CLEANING IN CONTROL OF ACID RAIN
May 1981 38 p
(Contract DE-AC21-80MC-14784)
(DE81-028930; DOE/MC-14784/T1) Avail: NTIS HC A03/MF A01

The acid rain problem and the feasibility of various control techniques are addressed. Two strategies that are proposed for control of acid rain, are considered, (1) use of naturally occurring low-sulfur coal; and (2) cleaning of raw coal in preparation plants prior to firing. The distribution and ownership of the US coal reserves are discussed with emphasis on the reserves having low sulfur content. Some of the basic constraints on the availability and use of low-sulfur coals by utilities are enumerated. A preliminary estimate of the sulfur reduction potential of US coals achievable by coal preparation is presented. Also included are a brief analysis of coal cleaning costs and the effects of coal cleaning on other aspects of acid rain control. DOE

N82-12676# Los Alamos Scientific Lab., N. Mex.
ENVIRONMENTAL CONTROL TECHNOLOGY FOR COAL CLEANING WASTES
P. Wagner, R. C. Heaton, L. E. Wangen, A. M. Nyitray, and M. M. Jones 1981 20 p refs Presented at a Workshop on Processing Needs and Methodology for Wastewaters from the Conversion of Coal, Oil Shale and Biomass to Synfuels, Germantown, Md., Jun. 1981
(Contract W-7405-eng-36)
(DE81-025331; LA-UR-81-1904; CONF-8106109-1) Avail: NTIS HC A02/MF A01

Three approaches to solution of the coal waste drainage problem are considered. The first is alteration of the waste to render it nonpolluting. Calcining of the waste is shown to be an effective way of accomplishing this, but the cost of this technique is too high. The second approach is codisposal of the coal waste with neutralizing and/or absorbing agents. The best way to implementing this approach is sequential slurry coating of the coal waste with lime and limestone, which is both effective and inexpensive. This is the best of the one time treatment which were evaluated when both effectiveness and cost are considered. The third approach to controlling coal waste effluent is by alkaline neutralization of the drainages. It is shown that it is effective provided that the iron is oxidized to the plus three oxidation state, and that the cost of this treatment is low. T.M.

N82-12677# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany). Inst. fuer Physik.
THREE DIMENSIONAL SIMULATION MODEL MODIS FOR THE PROPAGATION OF AIR POLLUTANTS
D. Eppel, J. Haeuser, and A. Mueller 13 Mar. 1981 15 p refs Presented at 5th Intern. Clean Air Congr., Buenos Aires, 20-26 Oct. 1980
(GKSS-80-E-56; ISSN-0344-9629) Avail: NTIS HC A02/MF A01

A three-dimensional model for the propagation of pollutants in the atmosphere is presented. The moments of the unknown concentration distribution with respect to one horizontal coordinate, i.e., normalization, mean value, width, skewness, etc., are determined by integrating numerically the pertaining transport equations over a vertical plane oriented in the main flow direction. The original three dimensional distribution can then be reconstructed approximately. Partial absorption at the surface boundary as well as decay, rainout, and washout processes may be simulated for various meteorological conditions. The numerical treatment of the transport equation is done using discrete element techniques. The resulting equations are integrated by an explicit scheme. Author (ESA)

N82-12678# Skelly and Loy, Harrisburg, Pa.
A LAND USE DECISION METHODOLOGY FOR MINE LANDS IN APPALACHIA Final Report
Charles Yuill, William T. Gorton, and Michael Frakes May 1981 319 p refs Sponsored in part by EPA
(Contract ARC-80-14/PA-7105)
(PB81-220113; ARC-80-14/PA-7105) Avail: NTIS HC A14/MF A01 CSCL 13B

The methodology which was developed presents a framework which is useful for examining land use options for previously mined land currently active mine sites, and unmined land which has a high value or likelihood for future mining are also discussed. T.M.

N82-12679# Environmental Protection Agency, Edison, N.J.
A STATISTICAL EVALUATION OF OHMSETT TESTING Final Report
Diane M. Foster, Sol H. Schwarz, and Gary F. Smith Jul. 1981 39 p ref Prepared in cooperation with Mason and Hanger-Silas Mason Co., Inc., Leonardo, N.J.
(Contract EPA-68-03-2642)
(PB81-226128; EPA-600/2-81-124) Avail: NTIS HC A03/MF A01 CSCL 13B

This program was initiated to provide a statistical evaluation of performance data generated at the USEPA's Oil and Hazardous Materials Simulated Environmental Test Tank (OHMSETT). The objective was to investigate the value of replicate testing in developing efficient test programs giving the maximum reliable information from the minimum number of tests. This study was set up in two separate programs, each consisting of 24 tests: one program where 24 different conditions were tested and a second program where three replicates each of eight different conditions were tested. A comparison was then possible between the two types of programs. The 3-replicate test matrix was duplicated to produce six replicates and the validity of the nonreplicate and 3-replicate programs was evaluated with respect to the 6-replicate data. GRA

N82-12680# New Mexico State Univ., Las Cruces.
ASSESSMENT OF WATER SUPPLY CONTAMINATION DUE TO UNDERGROUND COAL GASIFICATION
Thomas M. Niemczyk and Edward A. Walters Dec. 1980 105 p refs Prepared in cooperation with New Mexico Univ., Albuquerque.
(PB81-209215; WRRI-128; W81-03269;
OWRT-B-061-NMEX(1)) Avail: NTIS HC A06/MF A01 CSCL 13B

The potential for pollution by metal ions of groundwater as a consequence of proposed underground coal gasification was assessed focusing on subbituminous coal of the San Juan Basin in northwestern New Mexico. Baseline results for major and trace metal analysis of groundwater and minerals, anionic analyses, and trace organic analyses of groundwater are presented. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-12681 Dartmouth Coll., Hanover, N.H.
AN EXPERIMENTAL STUDY OF THE PROPAGATION AND

DISPERSION OF INTERNAL ATMOSPHERIC GRAVITY WAVES Ph.D. Thesis
Kenneth Alan Ballard 1981 423 p
Avail: Univ. Microfilms Order No. 8120765

Traveling ionospheric disturbances (TID's) are the manifestation, in the ionized medium, of internal atmospheric gravity waves. A model describing the propagation of gravity waves in an isothermal atmosphere is presented. The dispersion relation is derived from fundamental principles, and the relation between phase velocity and group velocity is examined. The effects of the Coriolis force and horizontally stratified winds on wave propagation are also analyzed. Conservation of energy in the gravity wave requires increasing amplitude with increasing altitude, inasmuch as the atmospheric density decreases with height. However, this is counteracted by dissipation of wave energy by ion drag, thermal conductivity, and viscous damping. The production of TID's (in the ionized medium) by gravity waves (in the neutral medium) is discussed in quantitative terms, and the vertical predictive function were derived. Dissert. Abstr.

N82-12682 Saint Louis Univ., Mo.
DETERMINATION OF CRUSTAL Q STRUCTURE FROM MULTI-MODE SURFACE WAVES Ph.D. Thesis
Chung-Chuan Cheng 1980 169 p
Avail: Univ. Microfilms Order No. 8120600

Determinations of Q structures are made using a method which matches theoretical and observed surface wave spectra. The importance of the method lies in its ability to utilize relatively short paths between a single source and a single receiver, both of which are preferably located within a single geologic province. In order to obtain theoretical Rayleigh wave spectral amplitudes at relatively short periods, improvements are made to existing computational schemes for computing the displacement-stress eigenfunctions as functions of depth. The effects of focal depth variations on the Rayleigh wave spectra for both fundamental and higher modes are studied. Inclusion of higher-mode data not only broadens the data base, but is also helpful when there is focal depth ambiguity. Dissert. Abstr.

N82-12683 Washington Univ., Seattle.
AN INVESTIGATION OF SAND AND SANDSTONE PERMEABILITY DEGRADATION AT ELEVATED TEMPERATURE AND PRESSURE Ph.D. Thesis
James Arthur Stottlemyre 1981 177 p
Avail: Univ. Microfilms Order No. 8121249

Masillon sandstone, 'virgin' Ottawa sand, and 'washed' Ottawa sand were examined. The dependent variables monitored during the experiments were permeability, volumetric strain, pH, suspended solids, and dissolved solids. Potential permeability damage mechanisms investigated include: pore volume reduction via bulk sample compaction and/or thermal expansion of constituent minerals, thermomechanical fragmentation, salinity and/or pH-induced particle dispersion, and temperature-induced internal or external particulate plugging. It is concluded that Masillon sandstone and Ottawa sand intrinsic permeabilities to deionized, deaerated water are not temperature sensitive to a significant degree provided certain precautions are taken to avoid colloidal contamination from the upstream hardware.
Dissert. Abstr.

N82-12684 Texas Univ. at El Paso.
HEAT FLOW STUDIES AND GEOTHERMAL EXPLORATION IN WESTERN TRANS-PECOS TEXAS Ph.D. Thesis
Bruce D. G. S. Taylor 1981 339 p
Avail: Univ. Microfilms Order No. 8121977

The definition of possible geothermal resources in Trans-Pecos Texas, and a geothermal gradient map of the region are presented, based on nearly 200 temperature and gradient measurements. Several areas of high thermal gradient are located, notably in Presidio County, where several hot springs and wells exist. Possible mechanisms for the high gradients (and heat flow) here are discussed. A small high gradient area is also indicated in northeast El Paso County, and a geophysical investigation of this prospect is described. The proximity to the city of El Paso made this a prime target for resource evaluation. Geophysical methods employed include gravity, self-potential and electrical resistivity, the surveys culminating in a shallow drilling program to define the areal extent of the anomaly. Dissert. Abstr.

N82-12685* National Aeronautics and Space Administration. Pasadena Office, Calif.
MICROWAVE LIMB SOUNDER Patent
Jacob J. Gustincic, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 4 Aug. 1981 9 p Filed 24 Sep. 1979 Supersedes N79-34014 (17 - 24, p 3285) Sponsored by NASA
(NASA-Case-NPO-14544-1; US-Patent-4,282,525; US-Patent-Appl-SN-078612; US-Patent-Class-343-100ME; US-Patent-Class-343-100PE; US-Patent-Class-343-781P) Avail: US Patent and Trademark Office CSCL 04A

Trace gases in the upper atmosphere can be measured by comparing spectral noise content of limb soundings with the spectral noise content of cold space. An offset Cassegrain antenna system and tiltable input mirror alternately look out at the limb and up at cold space at an elevation angle of about 22. The mirror can also be tilted to look at a black body calibration target. Reflection from the mirror is directed into a radiometer whose head functions as a diplexer to combine the input radiation and a local ocillator (klystron) beam. The radiometer head is comprised of a Fabry-Perot resonator consisting of two Fabry-Perot cavities spaced a number of half wavelengths apart. Incoming radiation received on one side is reflected and rotated 90 deg in polarization by the resonator so that it will be reflected by an input grid into a mixer, while the klystron beam received on the other side is also reflected and rotated 90 deg, but not without passing some energy to be reflected by the input grid into the mixer.
Official Gazette of the U.S. Patent and Trademark Office

N82-12686# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Dept. of National Development and Energy.
THE ARRINTHRUNGA FORMATION: UPPER CAMBRIAN EPEIRIC CARBONATES IN THE GEORGINA BASIN, CENTRAL AUSTRALIA
John Kennard 1981 67 p refs
(BMR-Bull-211; ISBN-0-642-06504-7; ISSN-0084-7089) Avail: NTIS HC A04/MF A01

A sedimentological study of the Upper Cambrian Arrinthrunga formation, a complex carbonate and mixed carbonate siliciclastic shelf sequence in the Georgina Basin, central Australia is presented. The determination and description of lithofacies within the sequence, and the elucidation of their environments of deposition are emphasized. A regional model of the depositional environments and the history of sedimentation is developed. S.L.

N82-12687*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SAGE MEASUREMENTS OF THE STRATOSPHERIC AEROSOL DISPERSION AND LOADING FROM THE SOUFRIERE VOLCANO
M. Patrick McCormick, Geoffrey S. Kent (Institute for Atmospheric Optics and Remote Sensing Hampton, Va.), Glenn K. Yue (Institute for Atmospheric Optics and Remote Sensing Hampton, Va.), and Derk M. Cunnold (Georgia Inst. of Techn., Atlanta) Nov. 1981 23 p refs
(NASA-TP-1922; L-14611) Avail: NTIS HC A02/MF A01 CSCL 04A

Explosions of the Soufriere volcano on the Caribbean Island of St. Vincent reduced two major stratospheric plumes which the stratospheric aerosol and gas experiment (SAGE) satellite tracked to West Africa and the North Atlantic Ocean. The total mass of the stratospheric ejecta measured is less than 0.5% of the global stratospheric aerosol burden. No significant temperature or climate perturbation is expected. It is found that the movement and dispersion of the plumes agree with those deduced from high altitude meteorological data and dispersion theory. The stratospheric aerosol dispersion and loading from the Soufrier volcano was measured. E.A.K.

N82-12688# Geological Survey, Washington, D. C.
MOUNT ST. HELENS VOLCANIC-ASH FALL IN THE BULL RUN WATESHED, OREGON, MARCH - JUNE 1980
Michael V. Shulters and Daphne G. Clifton 1980 19 p refs

(USGS-CIRC-850-A) Avail: NTIS HC A02/MF A01

Volcanic ash fall from the eruption of Mount St. Helens, Washington, was studied. Water samples collected from three stream sites within the Bull Run Watershed were compared with samples collected during the same season in previous years. No detectable changes were noted in chemical characteristics. Precipitation samples collected immediately after the June 12 and 13 ash fall ranged in specific conductance from 20 to 41 micromhos per centimeter at 25 C and in pH from 4.0 to 4.3 pH units. Stream samples collected during the May to June period ranged in specific conductance from 18 to 28 micromhos per centimeter at 25 C and in pH from 6.7 to 7.5 pH units. Volcanic ash samples were collected and analyzed for particles size, chemical composition, and weight. Significant differences in particle size of ash were found in samples from two separate eruptions. R.J.F.

N82-12689# Geological Survey, Washington, D. C.
EFFECTS OF VOLCANISM ON THE GLACIERS OF MOUNT ST. HELENS
Melinda M. Brugman and Austin Post 1981 15 p
(USGS-CIRC-850-D) Avail: NTIS HC A02/MF A01

The cataclysmic eruption of Mount St. Helens May 18, 1980, removed 2.9 sq/km of glacier snow and ice including a large part of Shoestring Forsyth, Wishbone, Ape, Nelson, and all of Loowit and Leschi Glaciers. Minor eruptions and bulging of the volcano from March 27 to May 17 shattered glaciers which were on the deforming rock and deposited ash on other glaciers. Thick ash layers persisted after the May 18 eruption through the summer on most of the remaining snow and ice, and protected winter snow from melting on Swift and Dryer Glaciers. Melting and recrystallization of snow and ice surviving on Mount St. Helens could cause and lubricate mud flows and generate outburst floods. Author

N82-12690# Geological Survey, Washington, D. C.
EARTHQUAKES IN THE UNITED STATES, JULY - SEPTEMBER 1979
J. H. Minsch, C. W. Stover, W. J. Person, and P. K. Smith 1980 43 p refs
(USGS-CIRC-836-C) Avail: NTIS HC A03/MF A01

This earthquake information supplements that published in the NEIS (National Earthquake Information Service) publications, PDE ('Preliminary Determination of Epicenters') and 'Preliminary Determination of Epicenters, Monthly Listing', by providing detailed felt and intensity data, for U.S. earthquakes. It provides a complete listing of macroseismic effects of earthquakes, which can be used in risk studies, nuclear power plant site evaluations, seismicity studies, and to answer inquiries by the public. The first part (table 1), which is mainly concerned with data obtained by seismographs, is a tabular listing of earthquakes in chronological order by State, consisting of the following basic information: date, origin time, hypocenter, magnitude, maximum intensity, and computational source of the hypocenter. The second section, which concerns intensity information, consists of two maps and table 2. This section also contains information on events which were felt but were not listed in the PDE because there was not enough instrumental data to obtain a solution. J.F.M.

N82-12691# Geological Survey, Washington, D. C.
EARTHQUAKES IN THE UNITED STATES, JANUARY - MARCH 1979
C. W. Stover, J. H. Minsch, B. G. Reagor, and P. K. Smith 1980 46 p refs
(CIRC-836-A) Avail: NTIS HC A03/MF A01

This earthquake information supplements that published in the NEIS (National Earthquake Information Service) publications, PDE ('Preliminary Determination of Epicenters') and 'Preliminary Determination of Epicenters, Monthly Listing', to the extent of providing detailed felt and intensity data, as well as isoseismal maps for U.S. earthquakes. It provides a complete listing of macroseismic effects of earthquakes, which can be used in risk studies, nuclear power plant site evaluations, seismicity studies, and answering inquiries by the public. The first (table 1) is a tabular listing of earthquakes in chronological order by State, consisting of the following basic information: date, origin time, hypocenter, magnitude, maximum intensity, and computational source of the hypocenter. The second section consists of six maps and table 2, which lists detailed intensity information. L.F.M.

N82-12692*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE GEODETIC STABILITY OF THE GODDARD OPTICAL RESEARCH FACILITY
William J. Webster, Jr., Paul D. Lowman, Jr., and Richard J. Allenby Sep. 1981 25 p refs Submitted for publication
(NASA-TM-82175) Avail: NTIS HC A02/MF A01 CSCL 08G

Seismic observations of earthquakes and blasts, geologic analysis of LANDSAT images, and a search of the historical record was examined. However, no evidence for tectonic motion was found. Some faulting is present in the area but no evidence of seismic activity was found. No elastic resonances in the range from 0.3 to 15 Hz were found. It is concluded that, except for ground water induced changes, the facility is stable at least to the 0.5 cm level. E.A.K.

N82-12693# Geological Survey, Washington, D. C.
BIOGEOCHEMICAL EVIDENCE FOR SUBSURFACE HYDROCARBON OCCURRENCE, RECLUSE OIL FIELD, WYOMING: PRELIMINARY RESULTS
Mary C. Dalziel and Terrence J. Donovan 1980 14 p refs
(USGS-CIRC-837) Avail: NTIS HC A02/MF A01

Anomalously high manganese to iron ratios occurring in pine needles and sage leaves over the Recluse oil field, Wyoming, suggest effects of petroleum microseepage on the plants. This conclusion is supported by iron and manganese concentrations in soils and carbon and oxygen isotope ratios in rock samples. Seeping hydrocarbons provided reducing conditions sufficient to enable divalent iron and manganese to be organically complexed or adsorbed on solids in the soils. These bound or adsorped elements in the divalent state are essential to plants, and the plants readily assimilate them. The magnitude of the plant anomalies, combined with the supportive isotopic and chemical evidence confirming petroleum leakage, makes a strong case for the use of plants as a biogeochemical prospecting tool. Author

N82-12694# Geological Survey, Menlo Park, Calif.
SEISMIC ENGINEERING PROGRAM REPORT, SEPTEMBER - DECEMBER 1979
Ronald L. Porcella, ed. 1980 64 p refs
(Grant NSF CA-114)
(USGS-CIRC-818-C) Avail: NTIS HC A04/MF A01

A summary of the accelerograms recovered from the USGS National Strong-Motion Network during the period September 1, 1979 through December 31, 1979 is presented. Data recorded during the October 15, 1979 Imperial Valley earthquake are presented, as are summaries of recent strong motion reports, notes in the availability of digitized data and information on other strong motion programs. S.L.

N82-12695*# California Inst. of Tech., Pasadena. Seismology Lab.
GLOBAL ISOSTATIC GEOID ANOMALIES FOR PLATE AND BOUNDARY LAYER MODELS OF THE LITHOSPHERE
Bradford H. Hager 10 Nov. 1981 34 p refs
(Grant NsG-7610)
(NASA-CR-164985) Avail: NTIS HC A03/MF A01 CSCL 08G

Commonly used one dimensional geoid models predict that the isostatic geoid anomaly over old ocean basins for the boundary layer thermal model of the lithosphere is a factor of two greater than that for the plate model. Calculations presented, using the spherical analogues of the plate and boundary layer thermal models, show that for the actual global distribution of plate ages, one dimensional models are not accurate and a spherical, fully three dimensional treatment is necessary. The maximum difference in geoid heights predicted for the two models is only about two meters. The thermal structure of old lithosphere is unlikely to be resolvable using global geoid anomalies. Stripping the effects of plate aging and a hypothetical uniform, 35 km, isostatically-compensated continental crust from the observed geoid emphasizes that the largest-amplitude geoid anomaly is the geoid low of almost 120 m over West Antarctica, a factor of two greater than the low of 60 m over Ceylon. Author

N82-12696*# California Inst. of Tech., Pasadena. Seismological Lab.
FUNDAMENTAL STUDIES IN GEODYNAMICS Semiannual Report, 1 Feb. - 31 Jul. 1981
Don L. Anderson, Bradford H. Hager, and Hiroo Kanamori 31 Jul. 1981 64 p
(Grant NsG-7610)
(NASA-CR-164990) Avail: NTIS HC A04/MF A01 CSCL 08K

Research in fundamental studies in geodynamics continued in a number of fields including seismic observations and analysis, synthesis of geochemical data, theoretical investigation of geoid anomalies, extensive numerical experiments in a number of geodynamical contexts, and a new field seismic volcanology. Summaries of work in progress or completed during this report period are given. Abstracts of publications submitted from work in progress during this report period are attached as an appendix. L.F.M.

N82-12697*# National Aeronautics and Space Administration, Washington, D. C.
NASA GEODYNAMICS PROGRAM Annual Report
Oct. 1981 83 p refs
(NASA-TM-84010; ERG-2; AR-2) Avail: NTIS HC A05/MF A01 CSCL 08G

The status, progress, and future plans of the program are given. A list of publications of research results supported by the program is included. T.M.

N82-12698*# Pennsylvania State Univ., University Park. Dept. of Geosciences.
SYNTHESIS OF REGIONAL CRUST AND UPPER-MANTLE STRUCTURE FROM SEISMIC AND GRAVITY DATA Final Report, 15 Jun. 1978 - 14 Jun. 1979
S. S. Alexander and P. M. Lavin 14 Jun. 1979 89 p refs
(Grant NsG-5276)
(NASA-CR-165001) Avail: NTIS HC A05/MF A01 CSCL 08K

Available seismic and ground based gravity data are combined to infer the three dimensional crust and upper mantle structure in selected regions. This synthesis and interpretation proceeds from large-scale average models suitable for early comparison with high-altitude satellite potential field data to more detailed delineation of structural boundaries and other variations that may be significant in natural resource assessment. Seismic and ground based gravity data are the primary focal point, but other relevant information (e.g., magnetic field, heat flow, LANDSAT imagery, goedetic leveling, and natural resources maps) is used to constrain the structure inferred and to assist in defining structural domains and boundaries. The seismic data consists of regional refraction lines, limited reflection coverage, surface wave dispersion, teleseismic P and S wave delay times, anelastic absorption, and regional seismicity patterns. The gravity data base consists of available point gravity determinations for the areas considered. S.L.

N82-12699*# Research Inst. of Colorado, Fort Collins.
RADIATION BUDGET MEASUREMENT/MODEL INTERFACE RESEARCH Semiannual Report
Thomas H. VonderHaar Oct. 1981 37 p refs
(Grant NAG1-150)
(NASA-CR-165000) Avail: NTIS HC A03/MF A01 CSCL 04A

The NIMBUS 6 data were analyzed to form an up to date climatology of the Earth radiation budget as a basis for numerical model definition studies. Global maps depicting infrared emitted flux, net flux and albedo from processed NIMBUS 6 data for July, 1977, are presented. Zonal averages of net radiation flux for April, May, and June and zonal mean emitted flux and net flux for the December to January period are also presented. The development of two models is reported. The first is a statistical dynamical model with vertical and horizontal resolution. The second model is a two level global linear balance model. The results of time integration of the model up to 120 days, to simulate the January circulation, are discussed. Average zonal wind, meridonal wind component, vertical velocity, and moisture budget are among the parameters addressed. J.M.S.

N82-12700# Naval Research Lab., Washington, D. C.
TOWARD AN UNDERSTANDING OF THE TURBULENT ELECTRODE EFFECT OVER LAND Interim Report
J. C. Willett 29 Sep. 1981 32 p refs
(RR0330242)
(AD-A104902; NRL-8519) Avail: NTIS HC A03/MF A01 CSCL 09/1

A new concept of the turbulent electrode effect, which has emerged from the recent work of Hoppel and of the author, is described. The past theoretical and observational research relating to the transformation of the classical electrode layer in the case of strong turbulent mixing is reviewed. Results of two experiments designed to test key predictions of the new theories are reported. The first experiment, measurement of the conductivity profile over land on windy days, lends some support to the theoretical prediction that both the positive and the negative polar components of the atmospheric conductivity should decrease toward the surface under turbulent conditions. The second experiment measurement of the nonconductive component of the vertical current density at the ground, tends to confirm a crucial assumption of the theories that all of the current is carried by turbulent and molecular diffusion at the surface. Suggestions are given for further experimental and theoretical work. Author (GRA)

N82-12701# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
PITCH-ANGLE DIFFUSION IN CANONICAL COORDINATES: A THEORETICAL FORMULATION
Michael Schulz 21 Aug. 1981 37 p refs
(Contract F04701-80-C-0081)
(AD-A105392; TR-0081(6960-06)-4; SD-TR-81-69) Avail: NTIS HC A03/MF A01 CSCL 04/1

The equation for pitch-angle diffusion (at constrant particle energy E and shell parameter L) in a dipole field can be transformed into canonical form, by the introduction of a new coordinate called z. The new coordinate is obtained by integrating the bounce period of a particle (at fixed E and L) with respect to y sq, where y is the sine of the equatorial pitch angle alpha sub 0. A potpourri of applications serves to illustrate the usefulness of such a transformation. For example, if D sub zz is a suitably simple function of z, one can specify the eigenfunctions g sub n(z) of the diffusion operator is closed form. If D sub zz differs only slightly from such a simple function of z, then the corresponding eigenfunctions can be generated from the above set by procedures analogous to the Rayleigh-Schrodinger perturbation theory used in quantum mechanics. The availability of such eigenfunctions enables one to evaluate quantitatively the manner in which geomagnetically trapped particles are redistributed in alpha sub 0 and lost from the magnetosphere as the phase-space density f evolves in time. GRA

N82-12702# Analytic Sciences Corp., Reading, Mass.
MILITARY GEODESY AND GEOSPACE SCIENCE UNIT FOUR
Warren G. Heller and A. Richard LeSchack Feb. 1981 120 p refs
(Contract F19628-77-C-0152; AF Proj. 3204)
(AD-A105073; SCIENTIFIC-8; AFGL-TR-81-0031) Avail: NTIS HC A06/MF A01 CSCL 08/5

Satellite systems with military applications are considered. The tracking telemetry, command, and data processing for various systems were reviewed. Ground tracking networks are described. Remote sensing features of several geodetic satellites are discussed. Navigational uses of the systems are highlighted. T.M.

N82-12703# Analytic Sciences Corp., Reading, Mass.
MILITARY GEODESY AND GEOSPACE SCIENCE, UNIT TWO
Warren G. Heller and A. Richard LeSchack Hanscom AFB, Mass. AFGL Feb. 1981 185 p
(Contract F19628-77-C-0152; AF Proj. 3204)
(AD-A105071; SCIENTIFIC-6; AFGL-TR-81-0029) Avail: NTIS HC A09/MF A01 CSCL 08/5

The general terrestrial mapping, charting, and geodesy (MC&G) problem can best be formulated as the problem of generating a metric description of the earth and its physical properties -- a description in which relative positions within and on the surface of the earth are accurately described, the figure

of the earth is accurately portrayed, and the gravitational, magnetic, and spin properties of the earth are fully represented in quantitative terms. Broader and more comprehensive definitions of the MC&G problem might be found within the domain of the planetological sciences, but the concept of quantitative metric relationships resulting from actual measurement processes will always be central to the definition. In the context of modern weapon systems, MC&G applications tend to concentrate in the areas of relative position determination on the surface of the earth and quantitative characterization of the terrestrial gravity field. The classical long-range artillery problem, for example, requires highly accurate knowledge of gun and target locations with respect to a common datum in a well-defined local coordinate system, together with approximate characterization of the gravity field, if a reliable one-shot hit capability is required. Practical constraints on achieving this capability, due partly to gun/target relative location limitations and partly to non-geodetic problems in the aiming process, lead to a multiple-shot, shoot-sense-correct philosophy that persists to this day. GRA

N82-12704# Control Data Corp., Minneapolis, Minn. Research and Advanced Design Lab.
MORPHOLOGY OF STRATOSPHERIC PLANETARY WAVES Final Report, 1 Jun. 1979 - 31 May 1981
Denis G. Dartt, R. W. Wilcox, and A. D. Belmont 28 Jul. 1981 42 p refs
(Contract F49620-79-C-0160; AF Proj. 2310)
(AD-A105006; AFOSR-81-0651TR) Avail: NTIS HC A03/MF A01 CSCL 04/1

This paper compares sudden warmings to find any consistent behavior of the important variables. The properties examined are amplitude and phase of planetary waves, sensible heat and momentum fluxes by each wave, and zonal means of geostrophic zonal wind, temperature, derived meridional wind and vertical motions. This is done for the seven warmings from 1970-74 for which daily gridden data up to 0.4 mb were available. GRA

N82-12705# Los Alamos Scientific Lab., N. Mex.
REDUCTION OF PHOTOSYNTHETICALLY ACTIVE RADIATION UNDER EXTREME STRATOSPHERIC AEROSOL LOADS
Siegfried A. W. Gerstl and Andrew Zardecki Aug. 1981 24 p refs
(Contract W-7405-eng-36)
(DE81-030506; LA-8938-MS) Avail: NTIS HC A02/MF A01

The hypothesis that the Cretaceous-Tertiary extinctions might be caused by an obstruction of sunlight is tested by model calculations. First the total mass of stratospheric aerosols under normal atmospheric conditions is compared for four different (measured) aerosol size distributions and vertical profiles. For comparison, the stratospheric dust masses after four volcanic eruptions are also evaluated. Detailed solar radiative transfer calculations are then performed for artificially increased aerosol amounts until the postulated darkness scenario is obtained. Thus it is found that a total stratospheric aerosol mass between 1 and 4 times 10 g is sufficient to reduce photosynthesis to 10 of normal. The impact of a 0.4 to 3 km diameter asteroid or a close encounter with a Halley size comet may deposit that amount of particulates into the stratosphere. The darkness scenario of Alvarez et al. is thus shown to be a possible extinction mechanism, even with smaller size asteroids of comets than previously estimated. DOE

N82-12706# California Univ., Livermore. Lawrence Livermore Lab. Test Ban Treaty Verification Program.
CALCULATIONS ON SEISMIC COUPLING OF UNDERGROUND EXPLOSIONS IN SALT
M. E. Heusinkveld 20 Jan. 1981 117 p refs
(Contract W-7405-eng-48)
(DE81-030633; UCRL-53103) Avail: NTIS HC A06/MF A01

The results of a theoretical study of seismic coupling and decoupling of underground explosions in a salt medium are presented. A series of chemical and nuclear explosions was carried out in salt domes for the Cowboy and the Dribble programs to provide experimental data on seismic coupling for both tamped explosions and explosions in cavities. the Cowboy program consisted of a series of chemical explosions, and the Dribble program consisted of the tamped nuclear Salmon event, the Sterling nuclear event in the Salmon cavity, and an associated site calibration errors. The results of extensive computer calculations, which are in satisfactory agreement with the experimental data are given. The calculations were extended to give general results on seismic coupling in salt. The measure of seismic coupling was the rsidential reduced displacement potential (residual RDP). The decoupling associated with a shot in a cavity is expressed as the ratio of the resulting residual RDP to that of an equal sized tamped shot. DOE

N82-12707# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.
ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK
Aug. 1981 176 p Prepared for Argonne National Lab.
(Contract DE-AC01-79CS-30027)
(DE82-000071; SOLAR/0010-81/08) Avail: NTIS HC A09/MF A01

Environmental information collected at the sites of the National Solar Data Network is tabulated for each solar site. The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the site. It also shows the ratio of total to extraterrestrial radiation. The temperature table gives the average, daytime, nighttime, maximum, minimum, and inlet-water temperature for the site. All of the passive and some active solar sites are equipped with wind sensors which provide information on wind speed and direction. For some sites, a humidity tables provides relative humidity values for day and night. It also gives values for the maximum and minimum humidity for each day. A technical discussion of the instruments and measurements used to obtain the data is included. DOE

N82-12708# Battelle Pacific Northwest Labs., Richland, Wash.
GEOCHEMICAL MODELING: A REVIEW
E. A. Jenne Jun. 1981 58 p refs
(Contract DE-AC06-76RL-01830)
(DE81-028969; PNL-3574) Avail: NTIS HC A04/MF A01

Two general families of geochemical models are reviewed. The ion speciation solubility group of geochemical models contain submodels to first calculate distribution of aqueous species and to secondly test the hypothesis that the water is near equilibrium with particular solid phases. The second geochemical models, the reaction path models, simulates the step wise precipitation of solid phase as a result of reacting specified amounts of water and rock. It is suggested that improvements in the present versions of these models enhances their value and usefulness to applications in nuclear waste isolation. DOE

N82-12709# Technische Universitaet, Brunswick (West Germany). Inst. fuer Geophysik und Meteorologie.
PROJECT PORCUPINE: MAGNETOMETER EXPERIMENT Final Report
Burkhard Theile and Hermann Luehr Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-80-028; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,10

The measurement of the particle current with a magnetometer is discussed. This allows an assessment of the total flux of particles originating from the magnetosphere and arriving in the ionosphere. The four sounding rocket payloads PORCUPINE, launched as part of the German contribution to the International Magnetosphere Study, were equipped with three component fluxgate magnetometers. Scientific data analysis for two flights is presented. The magnetic effects of active plasma experiments as well as of field aligned currents is observed. Author (ESA)

N82-12710# Fraunhofer Inst., Freiburg (West Germany).
IMPEDANCE PROBE EXPERIMENT IN PROJECT POLAR HIGH ATMOSPHERE OF THE SOUNDING ROCKET PROGRAM AERONOMY Final Report
Eugen Neske and Josef Molnar Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer

Forschung und Technologie
(BMFT-FB-W-80-035; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,80

An impedance probe was used to measure the absolute value of the local electron densities in the thermosphere and the ionosphere in order to deduce the conductivity. The frequency dependence of the mutual impedance of a double sphere system was used to determine the electron density. The applied electronic concept is described in detail. The electron temperature cannot be derived by means of this method. The electron density profiles and hence the conductivity profiles are determined with good accuracy and sufficient resolution. With regard to an exclusive measurement of the in situ electron density, the self-impedance probe is to be given preference over the transfer impedance probe used because interpretation of the measurement is simpler and safer. Author (ESA)

N82-12711# Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany).
REMOTE DETERMINATION OF ATMOSPHERIC GASES WITH A DF LASER Ph.D. Thesis - Hamburg Univ. [FERNMESSUNG ATMOSPHAERISCHER GASE MIT EINEM DF-LASER]
J. Altmann 1980 160 p refs In GERMAN; ENGLISH summary
(GKSS-80-E-40) Avail: NTIS HC A08/MF A01

A system for the remote quantitative depth resolved determination of atmospheric gases is described. Measurements can contribute to the control of air pollution in industrial areas. The system is based on the differential absorption and scattering of laser light, the so-called DIAL lidar technique. The possibilities of remote determination of gases with the aid of pulsed DF lasers were investigated. Special design features, such as the purely geometric compression of the signal amplitude dynamics, and commercially unavailable components, i.e., the fast sensitive low noise preamplifiers and the multiple input analog delay multiplexer, are described in detail. Molecular absorption cross sections required for calibration and interference evaluation are measured with a multipass absorption cell. As an example, results of a determination of atmospheric N2O are presented. Author (ESA)

N82-12712# Danish Meteorological Inst., Copenhagen.
DANISH METEOROLOGICAL INSTITUTE, RUDE SKOV, GEOPHYSICAL OBSERVATORY. MAGNETIC RESULTS Annual Report, 1979
Axel Hansen 1981 41 p ref
(ISBN-87-7478-187-1) Avail: NTIS HC A03/MF A01

The results of the standard observations carried out at the Rude Skov magnetic laboratory during 1979 are presented. The measurements show hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N82-12713# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
INFRARED SPECTROSCOPY OF MICROORGANISMS NEAR 3.4 MICRONS IN RELATION TO GEOLOGY AND ASTRONOMY
F. Hoyle, N. C. Wickramasinghe, S. Al-Mufti, and A. H. Olavesen Jun. 1981 11 p refs Submitted for publication
(Preprint-69) Avail: NTIS HC A02/MF A01

Cracking of microorganisms at high temperature and pressure were examined for the existence of microfossils in sedimentary rocks of the Isna series. Microorganism specimens were examined for degradation by infrared spectroscopy over the wavelength range from 2.5 microns to 15 microns. Stability up to 380 C after which there is degradation towards graphite is shown. It is concluded that the preservation of microfossils is feasible in rocks metamorphosized at temperatures of 400 C. Author (ESA)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-12714 Meteorologisches Observatorium, Hohenpeissenberg (West Germany).
SPECIAL OBSERVATIONS BY THE HOHENPEISSENBERG METEOROLOGICAL OBSERVATORY. NUMBER 42: RESULTS OF AEROLOGICAL AND SURFACE OZONE MEASUREMENTS DURING THE FIRST SEMESTER OF 1980 [SONDERBEOBACHTUNGEN DES METEOROLOGISCHEN OBSERVATORIUMS HOHENPEISSENBERG. NR 42: ERGEBNISSE DER AEROLOGISCHEN UND BODENNAHEN OZONMESSUNGEN IM 1. HALBJAHR 1980]
1980 194 p refs In GERMAN and ENGLISH
(Sonderbeob-42; ISSN-0581-1287) Avail: Issuing Activity

Tabular and graphical ozonometry results are presented. Surface ozone measurement data cover day of measurement, daily mean of ozone near the ground (nbar), daily maximum of ozone near the ground (nbar), hour of maximum (GMT), duration of extreme values in excess of 100 nbar in tens of minutes, daily minimum (nbar), and monthly mean (without extreme values). Total ozone measurement data, determined by Dobson-spectrophotometer, include day of measurement, time of observation, type of measurement, i.e., direct Sun blue zenith, number of measurements for daily mean, and total ozone amount for AD and C wavelengths (daily mean values). The pairs of wavelengths used are: 305.5 nm, 325.4 nm; 311.45 nm, 332.4 nm; and 317.6 nm, 339.8 nm. Author (ESA)

N82-12715*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE NUMERICAL STUDIES PROGRAM FOR THE ATMOSPHERIC GENERAL CIRCULATION EXPERIMENT (AGCE) FOR SPACELAB FLIGHTS
William W. Fowlis, ed. and M. H. Davis, ed. (Univ. Space Research Association, Boulder, Colo.) Nov. 1981 65 p refs Proc. of Meeting held in Boulder, Colo., 14-15 Apr. 1981
(NASA-CP-2200; M-366) Avail: NTIS HC A04/MF A01 CSCL 04B

The atmospheric general circulation experiment (AGCE) numerical design for Spacelab flights was studied. A spherical baroclinic flow experiment which models the large scale circulations of the Earth's atmosphere was proposed. Gravity is simulated by a radial dielectric body force. The major objective of the AGCE is to study nonlinear baroclinic wave flows in spherical geometry. Numerical models must be developed which accurately predict the basic axisymmetric states and the stability of nonlinear baroclinic wave flows. A three dimensional, fully nonlinear, numerical model and the AGCE based on the complete set of equations is required. Progress in the AGCE numerical design studies program is reported. For individual titles, see N82-12716 through N82-12723.

N82-12716*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OVERVIEW
William W. Fowlis *In its* The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 1-9 (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The creation of a spherical model in cylindrical geometry is discussed. The model requires a radial body force to simulate gravity. This force is achieved by dielectric effects on a liquid in the presence of a large voltage, but in the terrestrial laboratory it cannot be made large enough to overwhelm gravity. However, in an orbiting vehicle like Spacelab, this dielectric force will dominate. The behavior of a stripped down general circulation system (GCS) is a salient omission of GCM. It is suggested that the system will contribute to global weather and climate studies. E.A.K.

N82-12717*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE AGCE APPARATUS
William W. Fowlis *In its* The Numerical Studies Program for

the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 10-15 ref (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The atmospheric general circulation experiment (AGCE) apparatus, an instrument to extend previous experimental work on baroclinic flows in cylindrical geometry to spherical geometry was proposed. The instrument must be flown in Spacelab to allow the radial dielectric body force which simulates gravity to be dominant. The essential configuration of the proposed apparatus is shown. Some preliminary values of dimensions and imposed conditions are included. E.A.K.

N82-12718*# Arizona Univ., Tucson. Inst. of Atmospheric Physics.
HYDROSTATIC CALCULATIONS OF AXISYMMETRIC FLOW AND ITS STABILITY FOR THE AGCE MODEL
Timothy L. Miller and Robert L. Gall *In* NASA. Marshall Space Flight Center The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 16-22 (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

Baroclinic waves in the atmospherics general circulation experiment (AGCE) apparatus by the use of numerical hydrostatic primitive equation models were determined. The calculation is accomplished by using an axisymmetric primitive equation model to compute, for a given set of experimental parameters, a steady state axisymmetric flow and then testing this axisymmetric flow for stability using a linear primitive equation model. Some axisymmetric flows are presented together with preliminary stability calculations. E.A.K.

N82-12719*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CYLINDRICAL ANNULUS MODELS
Fred Leslie *In its* The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 23-32 refs (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The stability diagram for the atmospheric general circulation experiment (AGCE) was numerically determined. The cylindrical code of Warn-Varnas modified for linear stability and adapted to spherical geometry. The code computes axisymmetric basic states and then test their stability to zonal disturbances. The Warn-Varnas code and some of the basic state results are reported. E.A.K.

N82-12720*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPHERICAL MODELS: BASIC STATES AND STABILITY
Glyn O. Roberts *In its* The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 33-36 (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

Steady axisymmetric basic states in a spherical cap and their stability to azimuthally varying perturbations of different wave numbers were numerically investigated. The main features of the planned computer code and numerical methods are outlined. E.A.K.

N82-12721*# Tennessee Univ. Space Inst., Tullahoma.
THE THREE DIMENSIONAL SPHERICAL MODEL FOR THE AGCE
Basil N. Antar *In* NASA. Marshall Space Flight Center The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 37-39 (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The development of accurate numerical model of the atmospheric general circulation experiment (AGCE) is discussed. The model will serve both as a design and diagnostic tool for the AGCE, as well as for conducting numerical experiments which otherwise cannot be performed by AGCE. The code in its final form will solve the complete three dimensional nonlinear Navier-Stokes energy equations with the Boussinesq approximation. The code will allow for any thermal boundary conditions and any external forcing in the form of rotation and body forces and will allow for variable thermodynamic coefficients. E.A.K.

N82-12722*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MODEL VERIFICATION STUDIES USING ACCURATE MEASUREMENTS OF SPIN UP
Jae M. Hyun *In its* The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 40-43 refs (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

The reliability and accuracy of the numerical code for spin up flows in a cylinder by comparing the numerical results against high resolution laser Doppler velocimeter (LDV) measurements of the azimuthal flows were checked. A computer code to generate numerical solution for axisymmetric rotating fluid in a cylinder was obtained and amended for routine use at MSFC. The numerical simulations used the Navier-Stokes equations in axisymmetric form and employed finite difference techniques on both constant and variable grids. The numerical solutions are analyzed to gain further insight into the fundamental questions analyzed in rotating fluid dynamics. E.A.K.

N82-12723*# Miami Univ., Fla. School of Marine and Atmospheric Science.
PRELIMINARY REGIME DIAGRAM ON A SPHERE WITH A SIMPLIFIED GENERAL CIRCULATION MODEL
E. J. Pitcher, J. E. Geisler, and R. C. Malone (LASL) *In* NASA. Marshall Space Flight Center The Numerical Studies Program for the Atmospheric Gen. Circ. Expt. (AGCE) for Spacelab Flights Nov. 1981 p 45-55 (For primary document see N82-12715 03-47)
Avail: NTIS HC A04/MF A01 CSCL 04B

Numerical model studies useful design considerations and which can be accumulated to form the body of basic knowledge necessary for application of the atmospheric general circulation experiment (AGCE) data to understanding of atmospheric problems are reported. The most efficient way to obtain a computer model suitable for this objective is to modify an existing general circulation model (GCM) of the atmosphere rather than to develop such a model from first principles. The GCM and its modification is outlined. E.A.K.

N82-12724# Naval Environmental Prediction Research Facility, Monterey, Calif.
EVALUATION OF A METHOD FOR SHORT-RANGE FORECASTING OF EVAPORATION DUCT HEIGHTS Final Report ap HC A03/MF A01
Wayne A. Sweet Aug. 1981 40 p refs
(AD-A104892; NEPRF-TR-81-04) Avail: NTIS HC A03/MF A01 CSCL 04/2

A method for forecasting evaporation duct heights over periods of three to twelve hours is evaluated by comprising skill and threat scores to persistance scores. Although the evaluation of data from two ocean weather stations in the North Atlantic reveals an apparent advantage of the forecast method over persistance, an analysis of variance shows no statistically significant differences between the two sets of scores.
Author (GRA)

N82-12725# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
STANDARIZED WAVE AND WIND ENVIRONMENTS FOR NATO OPERATIONAL AREAS Final Report
Susan L. Bales, Wah T. Lee, and Joyce M. Voelker Jul. 1981 334 p refs
(AD-A105414; DTNSRDC/SPD-0919-01) Avail: NTIS HC A15/MF A01 CSCL 08/3

This report is a source document for specifying wind and wave conditions for those regions considered appropriate for joint operations of NATO naval forces. The areas considered are the North Atlantic Ocean northward from the Tropic of Cancer, the Mediterranean Sea, and coastal or landlocked areas such as the north, Baltic and Black Seas. The report provides seasonal and geographic distributions of wind and wave parameters and specifies mathematical models by which wave spectra, required by any ship seakeeping performance methodology, can be developed. Portions of the data are derived from the U.S. Navy's

emerging Twenty Year Hindcast Wind and Wave Climatology, and are considered to be far superior to data previously available for those operating areas. Author (GRA)

N82-12726# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
ADVERSE WEATHER AND NIGHT CAPABILITY: A CALL FOR ACTION. VOLUME 2: APPENDIX, DATA BASE FOR SELECTED IMPORTANT MILITARY LOCATIONS Final Report
Lucien M. Biberman Jun. 1981 204 p
(Contract MDA903-79-C-0202)
(AD-A104991; AD-E500390; IDA-P-1570-Vol-2; IDA/HQ-81-23660-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 04/2

This volume presents statistical data on relative humidity, absolute humidity, and visibility for selected locations of military importance. GRA

N82-12727# Weather Wing (7th), Scott AFB, Ill.
TERMINAL FORECAST REFERENCE NOTEBOOK, DETACHMENT 12, 15TH WEATHER SQUADRON FOR SELFRIDGE AIR NATIONAL GUARD BASE, MICHIGAN
John T. Pacek 30 Apr. 1981 43 p refs Revised
(AD-A105083; AD-E850099; Rept-7WW-TFRN-81-001) Avail: NTIS HC A03/MF A01 CSCL 04/2

This TFRN discusses the location, topography and local effects of Selfridge ANGB, MI. The meteorological importance of the Great Lakes, Lake St. Clair, Clinton River and pollution sources are also presented. The area's synoptic climatology is described and illustrated with typical examples. Climatic aids, forecasting techniques and problems are also discussed. GRA

N82-12728# Weather Wing (7th), Scott AFB, Ill.
TERMINAL FORECAST REFERENCE NOTEBOOK FOR SCOTT AIR FORCE BASE, ILLINOIS
David G. Knepper and Dee L. Keough 10 Jul. 1981 91 p refs Revised
(AD-A105084; AD-E850100; Rept-7WW-TFRN-81-002) Avail: NTIS HC A05/MF A01 CSCL 04/2

This TFRN discusses the location, topography and local effects, of Scott AFB, IL. The meteorological importance of the Great Lakes, air pollution sources, and physical location of weather equipment are presented. The area's synoptic climatology is described and illustrated with typical examples. Climatic aids, forecasting techniques and problems are also discussed. GRA

N82-12729# WestAq Corp., Grand Valley, Colo.
METEOROLOGICAL AND CLIMATOLOGICAL INVESTIGATION: REVIEW OF JANUARY - JUNE 1980 INVESTIGATIVE REPORT, VOLUME 1
David Rusty Lundberg and Hilding K. L. Spradlin Jul. 1981 170 p Prepared for Geokinetics, Inc., Concord, Calif.
(Contract DE-FC20-78LC-10787)
(DE81-030741; DOE/LC-10787/80-App-D-Vol-1) Avail: NTIS HC A08/MF A01

Since January 1979, a meteorological and climatological investigation for the purpose of establishing a microclimatic baseline has been continuously conducted at the Geokinetics oil shale research facility in Eastern Utah. The findings for only a six month segment (January 1 - June 30, 1980) of that ongoing investigation are presented. The WestAq data printouts are given. DOE

N82-12730# WestAq Corp., Grand Valley, Colo.
METEOROLOGICAL AND CLIMATOLOGICAL INVESTIGATION: REVIEW OF JANUARY - JUNE 1980 INVESTIGATIVE PERIOD, VOLUME 2
D. R. Lundberg and Hilding K. L. Spradlin Jul. 1981 145 p Prepared for Geokinetics, Inc., Concord, Calif.
(Contract DE-FC02-78LC-10787)
(DE81-030742; DOE/LC-10787/80-App-D-Vol-2) Avail: NTIS HC A07/MF A01

Since January 1979, a meteorological and climatological investigation for the purpose of establishing a microclimatic baseline has been continuously conducted at the Geokinetics oil shale research facility in eastern Utah. The findings for a six month segment (January 1 - June 30, 1980) of that ongoing investigation are presented. The WestAq data printouts are given. DOE

N82-12731# Geokinetics, Inc., Concord, Calif.
METEOROLOGICAL AND CLIMATOLOGICAL INVESTIGATION: REVIEW OF JANUARY - JUNE 1980 INVESTIGATIVE PERIOD
D. R. Lundberg and H. K. L. Spradlin Jul. 1981 81 p refs
(Contract DE-FC20-78LC-10787)
(DE81-030740; DOE/LC-10787/80) Avail: NTIS HC A05/MF A01

Since January 1979, a meteorological and climatological investigation for the purpose of establishing a microclimatic baseline has been continuously conducted at the Geokinetics oil shale research facility in eastern Utah. This report, however, presents the findings for only a six month segment (January 1 - June 30, 1980) of that ongoing investigation. Included in this report is a description of the program design, the handling and interpretation of the data, and program improvement considerations commended for inclusion into future segments of the investigation. DOE

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-12732 California Univ., Los Angeles.
HYDROCARBON COMPOSITION OF SEDIMENTS, WATER, AND FAUNA IN SELECTED AREAS OF THE GULF OF MEXICO AND SOUTHERN CALIFORNIA MARINE ENVIRONMENT Ph.D. Thesis
Paul Joseph Mankiewicz 1981 350 p
Avail: Univ. Microfilms Order No. 8121004

Predominantly sediments but also water column and faunal samples were analyzed for their hydrocarbon content using high resolution gas chromatography and gas chromatography/mass spectrometry. Seawater and geographic variability of faunal analyses appeared to be governed by feeding habit and source composition whereas water column analyses indicated a consistent petroleum component with biological contributions varying with temperature and salinity. In the nearshore areas off Texas and Louisiana the water column contained notable concentrations of petroleum in the dissolved phase, most notably alkyl naphthalenes and phenanthrenes whereas the sediments were tainted with petroleum derived from combustion sources of crude oil and refined products. In southern California, the dominant source of hydrocarbons in intertidal sediments is petroleum derived from seepage. However, in the offshore areas dated cores and surficial sediment analyses suggest that while seepage sourced petroleum is present, the dominant source of hydrocarbons is combustion derived air pollution. Dissert. Abstr.

N82-12733 State Univ. of New York at Buffalo.
LONG OCEAN WAVES ON LINEARLY VARYING BOTTOM TOPOGRAPHIES Ph.D. Thesis
Wayne Lawrence Neu 1981 67 p
Avail: Univ. Microfilms Order No. 8122192

The effects of bottom topography on long free surface gravity ocean waves were studied. Wave trapping and transmission-reflection problems are considered. The topographies are described by straight parallel bottom contours which in cross section are composed of segments of constant and linear depth variations. Over linearly varying depth segments, the solution to the vertically integrated governing equations is given in terms of two Kummer functions. Solutions were found for time harmonic waves periodic in the along contour direction and of exponential decay behavior normal to the contours over the constant depth segments. Dispersion equations relate the wave frequency to the along ridge wave number for trapped waves. The ridge and trench problems examine the portion of the incident wave energy reflected by or transmitted past the topography and the continental slope and shelf problem examines the amplication of the incident wave at the coast and resonances over the shelf. Dissert. Abstr.

N82-12734*# EG and G Washington Analytical Services Center, Inc., Pocomoke City, Md.
BOUNDARY DETECTION CRITERIA FOR SATELLITE ALTIMETERS
C. F. Martin and R. L. Taylor Nov. 1981 61 p refs
(Contract NAS6-3075)
(NASA-CR-156880) Avail: NTIS HC A04/MF A01 CSCL 14B

A procedure for using satellite altimeter data to determine the time of crossing of a surface boundary, such as ocean land or ocean ice, with the primary objective to flag altimeter data that do not properly represent oceanographic measurements were studied. Water to land crossing and water to sea ice crossing were investigated. For ocean ice crossings, a large increase in AGC occurred. Waveform tests for increasing the probability of detecting an ocean land crossing were investigated. It is recommended that the boundary test be based on a fit of the full waveform to a limited parameter set at a rate of 5 to 10 second. E.A.K.

N82-12735# National Academy of Sciences - National Research Council, Washington, D. C. Maritime Transportation Research Board.
MARITIME SUPPORT FOR OCEAN-RESOURCES DEVELOPMENT Final Report
Jun. 1981 188 p refs
(Contract N00014-75-C-0711)
(AD-A104730) Avail: NTIS HC A09/MF A01 CSCL 08/10

The issues associated with ocean development to determine their implication for the U.S. maritime industry have been examined. The examination embraced ocean energy systems, offshore oil and gas activities, food from the sea, deep seabed mining, and the use of ocean space. The requirements that ocean-resource development places on the maritime industry do not show sharp differences from one resource to the next. While the technological base on which the means of recovery and use of the resources can be built and deployed has been developed, more scientific work and technological development are needed. However, it is the committee's opinion that the true factors pacing the effort to bring many of the resources into use and to achieve the many benefits are of an economic, legal, and public-policy nature. Author (GRA)

N82-12736# Naval Oceanographic Office, Bay St. Louis, Miss.
OCEANOGRAPHIC TECHNOLOGY INFORMATION SERVICE: USER'S GUIDE Final Report
George H. Miller Aug. 1981 59 p
(AD-A104670; NOO-RP-37) Avail: NTIS HC A04/MF A01 CSCL 05/2

The oceanograhic technology information service (OTIS) a data managment system with the purpose to identify, define and serve as focal point for oceanographic technological capabilities is discussed. The OTIS includes summary information on specific types to technology. Major technical areas covered include: (1) measurement a d sampling system, associated hardware and instrumentation; (2) mathematical, physical, computerized models; (3) data collection, reduction and analysis techniques; and (4) facilities providing calibration, testing, data reduction and analysis, fabrication of hardware and other services;. Author

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-12737 Utah State Univ., Logan.
HIGHER PLANT ACCLIMATION TO SOLAR ULTRAVIOLET-B RADIATION Ph.D. Thesis
Ronald Robberecht 1981 109 p
Avail: Univ. Microfilms Order No. 8121390

Plant acclimation to natural and intensified solar UV-B irradiance was investigated in three species, to determine: (1) the relationship between plant sensitivity and epidermal UV attenuation, (2) the effect of phenotypic changes in the leaf epidermis, resulting from UV-B exposure, on plant sensitivity to UV radiation, and (3) the plasticity of these changes in the epidermis leading to plant, acclimation to UV-B radiation. Epidermal UV transmittance was found to differ in magnitude and spectral distribution among the three species. Photosynthesis was not significantly depressed in the leaves of any of three species. A trend toward photosynthetic depression of response to UV-B irradiation was found. A mechanism of UV-B attenuation, and increase in the UV-B attenuation capacity of the epidermis, is suggested. It is suggested that the degree of plant sensitivity and acclimation to natural and intensified solar UV-B radiation involves a dynamic balance between the capacity for UV-B attenuation and UV-radiation repair mechanism in the leaf. Dissert. Abstr.

N82-12738# Norwegian Defence Research Establishment, Kjeller.
NEUROTRANSMITTER MECHANISMS IN THE NUCLEUS ACCUMBENS SEPTI AND RELATED REGIONS IN THE RAT BRAIN
Ivar Walaas Apr. 1981 26 p refs
(NDRE/PUBL-81/1001; ISSN-0085-4301) Avail: NTIS HC A03/MF A01

The localization of different transmitter candidate, particularly the amino acids gamma aminobutyrate (GABA) and glutamate (GLU), in limbic and basal ganglia regions in the rat brain was compared and the characteristics of nucleus accumbens were studied. The GABA neurons are found in nucleus accumbens, and GABA projections from this nucleus are identified in restricted basal forebrain and mesencephalic regions. The GLU projections from the neocortex or allocortex are terminated in nucleus accumbens and other forebrain and hypothalamic nuclei. Neurotransmitters in local neurons are identified in the hippocampus, nucleus accumbens, septurn and caudatoputamen by local kainic acid injections, while neurons in the mediobasal hypothalamus are studied after systemic treatment of newborn animals with monosodium glutamate. E.A.K.

N82-12739*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METHOD AND APPARATUS FOR DETECTING COLIFORM ORGANISMS Patent Application
Kenji Nishioka, David Nibley (Boeing Co., Palo Alto, Calif.), Eldon Jeffers (Boeing Co., Palo Alto, Calif.), and Richard Brooks, inventors (to NASA) (Boeing Co., Palo Alto, Calif.) Filed 26 Oct. 1981 25 p
(NASA-Case-ARC-11322-1; US-Patent-Appl-SN-315278) Avail: NTIS HC A02/MF A01 CSCL 06C

A sample containing coliform bacteria is cultured in a liquid growth medium. The cultured bacteria produce hydrogen which is vented to a second call containing a buffer solution in which the hydrogen dissolves. By measuring the potential change in the buffer solution caused by the hydrogen, as a function of time, the initial concentration of bacteria in the sample is determined. Alternatively, the potential change in the buffer solution can be compared with the potential change in the liquid growth medium to verify that the potential change in the liquid growth medium is produced primarily by the hydrogen gas produced by the coliform bacteria. NASA

N82-12740# Technische Hogeschool, Delft (Netherlands).
AN ENGINEERING STUDY OF BACTERIAL KINETICS AND ENERGETICS Ph.D. Thesis
A. A. Esener 1981 130 p refs
Avail: NTIS HC A07/MF A01

Bacterial kinetics and energetics were studied with reference to engineering applications. Three processes were identified: (1) to biosynthetic process during which presursors are formed from the substrate followed by the polymerization of them into biomass; (2) product formation; and (3) the maintenance processes. The distribution of the input energy and mass in the form of the substrate was studied in an attempt to manipulate the distribution so as to minimize the overall cost of the product. This was accomplished by describing the whole process in terms of a mathematical model and optimizing it according to an objective function. R.J.F.

N82-12741# International Atomic Energy Agency, Vienna (Austria).
GASTROINTESTINAL ALLERGY IN THE EXPERIMENTAL ANIMAL: THE USE OF RADIOIODINATED SERUM

ALBUMIN IN THE ASSESSMENT OF NEW DRUGS Final Report, 15 Oct. 1977 - 30 Nov. 1979
S. Freier Mar. 1980 24 p refs
(IAEA-R-2067-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A rat model to study of gastrointestinal allergy and means to prevent it was developed. Allergic sensitivity to certain proteins by injecting proteins and adjuvants in various regimes was induced in rats. For suckling rats sensitivity was established by oral administration of the protein. A hypersensitive gastrointestinal reaction to challenge was demonstrated by electron microscopy, by light microscopy with conventional staining techniques, and by a radionuclide procedure wherein (51) Cr labelled albumin injected intravenously shortly before the challenge concentrated in the intestinal walls in rough proportion to the severity of the reaction. It is found that suppressing the hypersensitive intestinal reaction, disodium cromoglycate, dexamethazone, aspirin, indomethecan, and ipobrufen are ineffective and aminophylline was a slight amelioration. DOE

N82-12742# Technische Universitaet, Munich (West Germany). Institut fuer Klinische Zytologie.
COMPILATION OF CELL DATA BANK FOR AUTOMATION IN DIAGNOSTIC CYTOLOGY Final Report
Karlheinz Otto Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 30 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-158; ISSN-0340-7606) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,30

Automated cell recognition systems with high resolution which are required to analyze separate cells to detect cellular margins are discussed. Classified cells are used for compiling a learning data set. The preparation technique was improved, aiming at sufficient cellular isolation. In order to create a learning data set, 10,000 isolated cells were selected. The preparation procedure entails a distinct increase of isolated squamous epithelial cells and a diminution of clusters as well as white blood cells. The significance of specific and stoichiometric staining is shown. Author (ESA)

N82-12743# Medical Biological Lab. RVO-TNO, The Hague (Netherlands).
CHEMICAL PROTECTION OF CELLS IN CULTURE AND MICE AGAINST X-IRRADIATION Progress Report
O. Vos and L. Budke Jan. 1979 16 p
(MBL-1979-2; TDCK-71758) Avail: NTIS HC A02/MF A01

The effects of X-rays on the survivability of mice and cells in culture is discussed. Clone formation of heteroploid kidney cells in vitro was used as the survival parameter for the cells. Two germanied thiazolidines give good results, even though the effectiveness level of cysteamine is not reached. Author (ESA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-12744* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 224
Oct. 1981 51 p
(NASA-SP-7011(224)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 127 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1981. Author

N82-12745 Pennsylvania State Univ., University Park.
SWEATING RESPONSES OF MEN AND WOMEN DURING EXERCISE IN HUMID AND DRY HEAT Ph.D. Thesis
Andrea Jean Frye 1981 80 p
Avail: Univ. Microfilms Order No. 8120427

Four men and four women were matched on aerobic capacity and surface area to weight ratio. Each subject was acclimated to and tested in two equivalent environments (dry bulb temperature and wet bulb temperature). Maximum density of sweat gland activation (SGA sub max) was determined with the use of methacholine. Suppression of sweating due to skin hydration (hidromeiosis) was evidenced in both sexes by significantly lower total body sweat rate (m sub sw) and chest sweat rate (m sub sw) in the humid heat as compared to the dry heat. The women maintained significantly lower M sub sw and chest m sub sw than the men in the humid heat, but there were no differences in sweating rates between sexes in the dry heat. In the women, the SGA relative to SGA sub max) (% SGA sub max) was significantly higher in the dry heat than in the humid heat, SGF was similar in both environments. In the men, SGF was significantly higher in the dry heat than in the humid heat, while %SGA sub max was similar in both environments. The women were more sensitive to hidromeiosis than the men, and the nature of the response to hidromeiosis differed between the sexes.
Dissert. Abstr.

N82-12746 Texas Univ. at San Antonio.
MEDICAL DIAGNOSTIC APPLICATION OF RADIOFREQUENCY RANGE ELECTROMAGNETIC WAVES Ph.D. Thesis
Michael Raymond Millner 1981 139 p
Avail: Univ. Microfilms Order No. 8120287

A method has been developed, using a scattering or S parameter network analyzer and a loop antenna, for measuring the phase change of the forward reflection S parameter, S11, in relation to volume changes. A phantom was designed utilizing a balloon immersed in saline with displacement volume measured in a standpipe. Volume changes were related to both changes in phase and amplitude of the S11. A model was developed, based on basic electromagnetic theory, of a wave propagating through a layer of water of varying thickness bounded by air. The complex reflection coefficient was calculated, plotted, and compared to the S11 for the phantom. Several different antenna designs were tested, including varying size and types. This method was applied to the study of breathing and cardiac volume changes in man. Both the amplitude and phase of the S11 parameter were correlated with a simultaneously recorded electrocardiogram. In order to correlate these measurements with cardiac volume changes, a dog was anesthetized, and by means of the thermal dilution technique, cardiac output was determined.Dissert. Abstr.

N82-12747 California Univ., Los Angeles.
MEASUREMENT OF THE BONE MINERAL DENSITY OF TRABECULAR BONE BY A COHERENT AND COMPTON SCATTERING TECHNIQUE Ph.D. Thesis
Shih-Shen Ling 1981 170 p
Avail: Univ. Microfilms Order No. 8120996

A simplified photon scattering method to measure the bone mineral density of the trabecular bone was studied. The method used the simultaneous detection of the coherent and Compton scattered photons from the bone sample in a narrow beam geometry. The bone mineral density is determined within the scattering volume which is defined by the configuration of the source and detector collimators and scattering angle. The size of the scattering volume is determined by the aperture diameter and the length of both the source and detector collimators for a geometric configuration, and scattering angle. The corrections to the coherent to Compton scattering ratio due to the presence of overlying tissue and the effect of fat content of the sample to this technique was also studied. A four source focused collimator was constructed to increase the incident photon intensity.
Dissert. Abstr.

N82-12748 California Univ., Los Angeles.
THE MAGNETOSTATIC FORCE PRODUCED BY CURRENT LOOPS AND IS MEDICAL APPLICATIONS Ph.D. Thesis
Osman Kaldirim 1981 132 p
Avail: Univ. Microfilms Order No. 8120984

The magnetostatic force on permeable bodies both theoretically and experimentally was studied. Recent technological advances are tremendously advantageous to the delivery of protein carrying biologically active substances. The use of magnetic fields serves as the driving force in a guidance system to transport these substances to specific sites within the living system. Spheres of protein approximately one micron in diameter are impregnated

with magnetite (Fe3O4) along with other desired substances, this combination of elements is then injected into the bloodstream. Once in the bloodstream they flow freely until the desirable site is reached. The magnetic fields and manetostatic forces which are necessary in the control of microspheres were analyzed. A theoretical analysis of the magnetostatic force due to current loops was made consisting of a systematic design and an experimental study involving the effects of magnetostatic forces on microspheres injected into animals. Dissert. Abstr.

N82-12749 Colorado Univ. at Boulder.
TRANSCUTANEOUS ELECTRICAL PERIPHERAL NERVE STIMULATION: IMPLICATIONS FOR NEURAL CONTROL MECHANISMS Ph.D. Thesis
Darrell Neal Jones 1981 158 p
Avail: Univ. Microfilms Order No. 8122295

Transcutaneous electric nerve stimulation (TENS) is used clinically to control chronic pain. Large nerve fiber activity which is induced by TENS is hypothesized to inhibit pain signals at spinal levels via the gate control mechanism. While TENS is highly effective in the control of chronic pain, few additional neural function effects are reported clinically. The paucity of such observations is enigmatic since the large fiber involvement characteristic of TENS impacts numerous peripheral neural functions. A battery of performance tests was given to volunteers under control conditions and acute clinical levels of TENS. The tests included reaction time tests, force estimation tasks, touch discrimination tests and temperature discrimination tests. The results show no significant TENS effects on sensory discrimination. However, TENS significantly affects motor function, as defined by slowed reaction times and reduced range of response in force estimation. Dissert. Abstr.

N82-12750 California Univ., San Diego.
THREE-DIMENSIONAL STRESS DISTRIBUTION IN ARTERIES: RADIAL COMPRESSION EXPERIMENTS OF ARTERIAL WALL; STRESS CONCENTRATION IN LUNG NEAR A CYLINDRICAL CAVITY; FINITE ELEMENT ANALYSIS OF PLEURAL SURFACE PRESSURE DISTRIBUTION IN DOG'S LUNG DURING ELECTROPHRENIC STIMULATION Ph.D. Thesis
Cheng-Jen Chuong 1981 167 p
Avail: Univ. Microfilms Order No. 8120521

A three dimensional stress strain relationship derived from a strain energy function of the exponential form was proposed for arterial wall. The effect of the nonuniform stress field in the radial direction on the water movement in arterial wall is pointed out. The elastic behavior of rabbit thoracic arteries in radial direction was studied by uniaxial compression order of magnitude of the elasticity in radial direction is the same as that in the circumferential and longitudinal directions. In the vicinity of cylindrical cavity the lung parenchyma can be subjected to very high stress concentration in the circumferential direction. Stress distributions at various infinity stretches as well as longitudinal stretches are given. During the electrophrenic stimulation the diaphragm contracts lowers and the apex t base length of the lung increase up to 25%. It is observed that reversal pleural pressure (p sub pl) gradient in which the basal p sub pl becomes more negative than the optical. This phenomena is studied by finite element method. Dissert. Abstr.

N82-12751*# BioTechnology, Inc., Falls Church, Va.
BIOMEDICAL RESEARCH
Washington NASA Nov. 1981 20 p
(Contract NASw-3469)
(NASA-CR-3487) Avail: NTIS HC A02/MF A01 CSCL 06B

Biomedical problems encountered by man in space which have been identified as a result of previous experience in simulated or actual spaceflight include cardiovascular deconditioning, motion sickness, bone loss, muscle atrophy, red cell alterations, fluid and electrolyte loss, radiation effects, radiation protection, behavior, and performance. The investigations and the findings in each of these areas were reviewed. A description of how biomedical research is organized within NASA, how it is funded, and how it is being reoriented to meet the needs of future manned space missions is also provided. T.M.

N82-12752*# General Electric Co., Houston, Tex. Apollo Systems Dept.
QUANTITATION OF TISSUE LOSS DURING PROLONGED SPACE FLIGHT
J. I. Leonard 24 Sep. 1979 44 p refs
(Contract NAS9-15487)
(NASA-CR-167460; TIR-74-LSP-9017) Avail: NTIS HC A03/MF A01 CSCL 06P

Data from Skylab missions related to tissue loss in space were analyzed. Significant changes in gross body composition occur during spaceflight, these include: alterations in water balance resulting from headward shifts of fluid, loss of musculoskeletal tissue, and alterations in fat depending upon the balance between caloric intake and energy expenditure. An effort was made to control the more essential components of body weight on the Skylab missions. E.A.K.

N82-12753*# General Electric Co., Houston, Tex.
SKYLAB WATER BALANCE ANALYSIS
J. I. Leonard 13 Apr. 1977 59 p refs
(Contract NAS9-14523)
(NASA-CR-167461) Avail: NTIS HC A04/MF A01 CSCL 06P

The water balance of the Skylab crew was analyzed. Evaporative water loss using a whole body input/output balance equation, water, body tissue, and energy balance was analyzed. The approach utilizes the results of several major Skylab medical experiments. Subsystems were designed for the use of the software necessary for the analysis. A partitional water balance that graphically depicts the changes due to water intake is presented. The energy balance analysis determines the net available energy to the individual crewman during any period. The balances produce a visual description of the total change of a particular body component during the course of the mission. The information is salvaged from metabolic balance data if certain techniques are used to reduce errors inherent in the balance method. E.A.K.

N82-12754# Technische Hogeschool, Delft (Netherlands).
IDENTIFICATION OF THE ADAPTIVE FEEDBACK OF THE HUMAN MOTOR SYSTEM USING THE RESPONSE DIFFERENCE METHOD Ph.D. Thesis
Anthonie Pieter Eland Jun. 1981 132 p refs Sponsored in part by the Netherlands Organization for the Advancement of Pure Research
Avail: NTIS HC A07/MF A01

Proprioceptive and the visual feedback of the human motor system in generating slow, goal directed movement was investigated. Two internal models are considered in the feedforward path. The sensory program specifies the expected position trajectory and its maximum velocity which explains the amplitude and the duration of the movement. The motor program is determined by the sensory program and the load's internal model and specific the amplitude and the duration of the force pattern. Learned goal directed movements are almost completely programmed. E.A.K.

N82-12755# Desmatics, Inc., State College, Pa.
A MONTE CARLO STUDY OF THE USE OF AUXILIARY INFORMATION IN THE DEVELOPENT OF AN IMPACT ACCELERATION INJURY PREDICTION MODEL
Dennis E. Smith and John J. Peterson Sep. 1981 14 p refs
(Contract N00014-79-C-0128; NR Proj. 207-037)
(AD-A105463; TR-112-9) Avail: NTIS HC A02/MF A01 CSCL 06/19

This report describes a small-scale Monte Carlo investigation of procedures for incorporating various sources of auxiliary information into an impact acceleration injury prediction model. Parameter estimates are tabulated and compared for standard and modified models. Based on the results of the investigation, the procedures appear to be helpful in reducing the mean square error of predictions. Author (GRA)

N82-12756# Arizona Univ., Tucson. Dept. of Pharmacology.
OXYGEN TOXICITY AND LUNG COLLAGENOUS PROTEIN Final Technical Report, 1 Sep. 1977 - 28 Feb. 1981
Klaus Brendel and I. Glenn Sipes 28 Feb. 1981 131 p refs
(Contract N00014-77-C-0506)

(AD-A104702) Avail: NTIS HC A07/MF A01 CSCL 06/20

The chemical composition and subunit structure of the basement membrane and collagenous components of the normal lung and of lungs exposed to agents promoting the formation of singlet oxygen and thereby produce oxidative damage to tissue components was investigated. The alveolar basement membrane, the structure and composition of this component of the extracellular matrix of the lung is determined that a complex population of proteins make up the extracellular matrix. Several new collagen types are described as well as high molecular weight non collagens that appear to be associated with normal basement membranes. It is concluded that the characterization of putative changes in the nature of matrix components in pathologic states lags behind a more thorough characterization of normal basement membrance and extracellular components. E.A.K.

N82-12757# Brookhaven National Lab., Upton, N. Y.

REPAIR OF CHEMICAL DAMAGE IN MAMMALIAN CELLS

R. B. Setlow 1981 10 p refs Presented at the NATO CNEN Conf., Rome, 24 Aug. - 5 Sep. 1981 Submitted for publication (Contract DE-AC02-76CH-00016)

(DE81-030823; BNL-30055; B10-3767; CONF-810873-1) Avail: NTIS HC A02/MF A01

The repair of chemical damage to DNA is discussed. Most chemicals of environmental concern do not react directly with cellular macromolecules but must first be activated to nucleophiles. The different reactivities between agents reacting directly and those that react indirectly may produce products whose yields as a function of dose are completely different even though the products themselves may be the same. Nucleotide excision measurements of DNA repair are used extensively to detect agents that react with DNA which measurements help identify dangerous DNA adduct. The chemical damages that mimic UV are repaired by nucleotide excision, and the chemicals give rise to bulky adducts. The excision repair of bulky DNA adducts mimics the repair of UV damage in many ways, however the identity of the repair pathways is still controversial. DOE

N82-12758# Atomic Energy of Canada Ltd., Chalk River (Ontario). Health Sciences Div.

BIOLOGICAL EFFECTS OF LOW DOSES OF IONIZING RADIATION: THREE REVIEW PAPERS

J. D. Childs and J. R. Johnson Sep. 1980 81 p refs

(AECL-7059) Avail: NTIS (US Sales Only)HC A05/MF A01; DOE Depository Libraries

The topics relate to the genetic effects of ionizing radiation. The dose-response relationship for the genetic and carcinogenic effects of low level radiation is discussed. A perspective on radiation exposures resulting from the use of nuclear energy is presented. T.M.

N82-12759# Atomic Energy of Canada Ltd., Pinawa (Manitoba).

RADIATION EFFECTS ON LIVING SYSTEMS. A BIBLIOGRAPHY OF AECL PUBLICATIONS

Norma J. Hawley Oct. 1980 38 p In ENGLISH; FRENCH summary

(AECL-6797) Avail: NTIS HC A03/MF A01

The bibliography is divided into three topic areas: radiobiology, radiation chemistry, and radiation biochemistry. The living systems are arranged as follows: animals, cellular, human, insects, and subcellular. T.M.

N82-12760# North Carolina Univ., Chapel Hill. Dept. of Biochemistry.

STUDIES IN ERYTHROPOIESIS: THE INFLUENCE OF THE GLYCOCALYX OF THE RED CELL MEMBRANE Ph.D. Thesis

M. W. Franco 1980 148 p refs

(Contracts DE-AS05-76EV-04157; EY-76-S-05-4157)

(DE81-030668; DOE/EV-04157/T3) Avail: NTIS HC A07/MF A01

The correlation between the removal from the circulation of aged cells and the production of new RBCs was investigated. An erthropoietic influence was associated with the glycocalyx of the erythrocyte membrane. The influencing factor, asialoglycophorin, was masked on the young RBC by an amino ketosugar, sialic acid. During the aging process, an increasing amount of sialic acid is removed from the membrane to expose the underlying erythropoietic message. The amount of erythropoietic activity was directly related to the number of desialated erythrocytes transfused and to the degree of desialation of the transfused erythrocytes. It is shown that asialoglycophorin is an erythrocyte stimulating factor following its isolation from the membrane and subsequent injection into test mice and both mouse and human asialoglycophorin and stimulatory. DOE

N82-12761# Australian Radiation Lab., Melbourne.

MEASUREMENT OF GONADAL AND BONE-MARROW DOSES FROM DENTAL RADIOGRAPHY

S. B. Solomon and N. D. Morris Jun. 1980 30 p

(ARL/TR-022; ISSN-0157-1400) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The method of calculation of the radiation doses to the gonads and to the active bone marrow arising from dental radiography is described. The bone-marrow doses have been calculated using a computer model of X-ray depth doses within the skull for typical dental radiographic examinations as performed in Australia. The ovarian and testicular doses, as a percentage of skin dose have been determined experimentally. The dependence of the gonadal doses on X-ray tube voltage, face to cone distance and direction of the X-ray beam relative to the face is detailed. DOE

N82-12762# Australian Radiation Lab., Melbourne.

GONADAL DOSES FROM RADIOTHERAPY

S. B. Solomon and N. D. Morris Jun. 1980 25 p

(ARL/TR-020; ISSN-0157-1400) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The measurement of scatter factors to the gonads from superficial and deep therapy is detailed and the analytic fits to the experimental data, as a function of field position, field size and beam energy are given. The data used to calculate the gonadal doses from treatments using linear accelerators, teletherapy and sealed sources are described and the analytic fits to the data given. DOE

N82-12763# Australian Radiation Lab., Melbourne.

GENETIC AND MEAN BONE-MARROW DOSES FROM MEDICAL USE OF UNSEALED RADIOISOTOPES

D. W. Keam Jun. 1980 21 p refs

(ARL/TR-023; ISSN-0157-1400) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Annual doses to the Australian population were derived for the year 1970 using results of a survey carried out at that time and published data on doses to individuals resulting from such use. Values of 3.9 and 38 microgray for the annual (per capita) genetic and mean bone marrow doses respectively are reported, which are similar to those reported for other countries at about that time. DOE

N82-12764# Australian Radiation Lab., Melbourne.

CONTRIBUTIONS TO THE GENETIC AND MEAN BONE-MARROW DOSES OF THE AUSTRALIAN POPULATION FROM RADIOLOGICAL PROCEDURES

T. N. Swindon and N. D. Morris Jun. 1980 111 p

(ARL/TR-017) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

The results of a national survey of radiological procedures used for diagnosis and therapy in medicine, dentistry, and chiropracty are reviewed. Statistical data for the distribution and frequency of various procedures in Australian hospitals and practices are summarized, together with their associated radiation doses. Annual genetically significant and mean bone-marrow doses to the Australian population arising from these procedures are derived for the survey year of 1970. Values of 176 microgray and 651 microgray for the annual (per capita) genetic and mean bone-marrow doses respectively are reported. These compare closely with corresponding estimates in other countries with similar medical practices to those in Australia. DOE

N82-12765# Oak Ridge National Lab., Tenn.

OVERVIEW OF THE BIOMEDICAL AND ENVIRONMENTAL PROGRAMS AT THE OAK RIDGE NATIONAL LABORATORY

H. A. Pfuderer, comp. and J. B. Moody, comp. Jul. 1981 62 p
(Contract W-7405-eng-26)
(DE81-027864; ORNL-5806) Avail: NTIS HC A04/MF A01

Biomedical and environmental research, to provide information on environmental, health, and safety considerations, which can be utilized in the formulation and implementation of energy technology decisions is discussed. Information for the understanding of short term and long term consequences of processes in new energy technologies were researched. The mechanisms responsible for biological and ecological damage caused by substances associated with energy production and repair mechanisms are investigated. DOE

N82-12766# Texas A&M Univ., College Station. Dept. of Chemistry, Medical Microbiology and Immunology.
IDENTIFICATION AND TOXICITY OF FRACTIONATED-SHALE-OIL COMPONENTS
K. Wittnebel, D. C. Shelly, C.-N. Ho, I. M. Warner, and J. M. Quarles 1981 17 p refs
(Contract DE-AS05-80EV-10404)
(DE81-028460; DOE/EV-10404/T1) Avail: NTIS HC A02/MF A01

A procedure for the separation and identification of polynuclear aromatic hydrocarbons (PNAs) is presented. This procedure comprises two steps. First, the shale oil is separated into fractions according to ring size on a Chromosorb LC-9 normal phase column. Then each of these fractions are separated into individual components and identified using an analytical reversed-phase Ultrasphere ODS 5 micrometer column. In addition, toxicity studies are carried out on each fraction obtained from the amine column to indicate which class of PNAs warrants special attention and analysis. The results of this approach are reported. T.M.

N82-12767# Netherlands Organization for Applied Scientific Research TNO, Delft. Raad voor Gezondheiddresearch TNO.
INVENTORY OF MEDICAL TECHNOLOGICAL RESEARCH IN THE NETHERLANDS Annual Report, 1979-1980 [INVENTARISATIE VAN HET MEDISCH-TECHNOLOGISCHE ONDERZOEK IN NEDERLAND 1979-1980]
J. G. A. Luijten May 1980 73 p In DUTCH
Avail: NTIS HC A04/MF A01

An inventory of medical-technological research in the Netherlands during the years 1979 and 1980 is presented. The research projects are listed with title, contact person, year of beginning and termination and number of man years.
Author (ESA)

N82-12768# National Physical Lab., Teddington (England). Acoustics Unit.
THRESHOLDS OF HEARING BY AIR CONDUCTION AND BY BONE CONDUCTION UNDER DIFFERENT MASKING CONDITIONS
M. S. Shipton and D. W. Robinson Jun. 1981 46 p refs
(NPL-Ac-100; ISSN-0143-7143) Avail: NTIS HC A03/MF A01

Air and bone conduction threshold determinations for 152 subjects in the age range 16 to 30 years are presented. Bone conduction tests were carried out using a vibrator applied to the left and right mastoid under three conditions at the contralateral ear: unoccluded, masked at 25 dB, and at 40 dB sensation level. By a systematic process of otological classification of the subjects, the bone conduction threshold for normal hearing was estimated with an uncertainty of less than 1 dB and was interpolated for masking noise levels from zero to 40 dB sensation level. Individual air-bone gaps are shown to be widely spread for an otologically normal group, but distributions are normal and have a mean value close to zero. Author (ESA)

N82-12769# National Physical Lab., Teddington (England). Acoustics Unit.
AN INVESTIGATION OF THE STATUS OF BONE CONDUCTION AUDIOMETER CALIBRATION IN THE NATIONAL HEALTH SERVICE
G. R. Torr and L. S. Whittle Jun. 1981 45 p refs
(NPL-Ac-101; ISSN-0143-7143) Avail: NTIS HC A03/MF A01

The accuracy and uniformity achieved in the calibration of bone conduction audiometers used in hospitals were studied. The acceleration output of precalibrated bone vibrator supplied as part of an audit kit was measured. the precalibration of the bone vibrator is on the order of 2 dB at all test frequencies, although the differences between the individual results and precalibration attained 5 dB at extreme frequencies in a few cases. However, differences are substantially reduced by reinterpreting the hospital measurements using determinations of the sensitivities of the artificial mastoids and by correcting the measurements to a common temperature. Author (ESA)

N82-12770# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE HEART RATE OF ASPIRANT AIR PILOTS IN A HYPOBARIC CHAMBER
A. W. K. Gaillard and C. L. Truijens 1979 21 p refs
(Contract A72/K/070)
(IZF-1979-35; TDCK-73413) Avail: NTIS HC A02/MF A01

Changes in heart rate, caused by stress induced when atmospheric pressure in a hypobaric chamber is suddenly decreased, are studied. The use of heart rate variables as a pilot selection criterion is also considered. Results show that the heart rate measures only differ between a group of experienced subjects and the other groups. No correlations are found between the heart rate measures and personality test scores, which were obtained from questionnaires given directly after stress exposure. Author (ESA)

N82-12771# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DAMAGE RISK CRITERIA FOR IMPULSE NOISE
G. F. Smoorenburg 1980 35 p refs Presented at Intern. Symp. on New Perspectives on Noise Induced Hearing Loss, Cazenovia, New York, 15-18 Jun. 1980
(Contract A76/K/103)
(IZF-1980-26; TDCK-75018) Avail: NTIS HC A03/MF A01

Data on temporary threshold shifts (TTS) due to impulse noise exposure are evaluated. Peak levels of the impulses are determined at which only 10% of the people exposed show TTS, two minutes after exposure, of 15 dB or more averaged over the threshold shifts at 1, 2, and 3 kHz (TTS 1, 2, 3 > 15 dB). These peak levels are a function of the number of impulses per exposure times the duration of a single impulse. The result is compared with TTS data on steady noise as a function of exposure duration, and with data on permanent threshold shifts (PTS) induced by impulse and intermittent noise. This suggests that < 10% of the people exposed to impulse noise each working day will develop noise induced PTS 1, 2, 3 of 15 dB or more if the equivalent level of the noise is 85 dB. The hearing loss fence of 15 dB PTS 1, 2, 3 is discussed for loss of speech discrimination in a noisy background and it is shown that a higher fence cannot be allowed. The attenuation from ear plugs is less than laboratory values. Author (ESA)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-12772*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOT ESTIMATES OF GLIDEPATH AND AIM POINT DURING SIMULATED LANDING APPROACHES
C. W. Acree, Jr. Nov. 1981 21 p refs
(NASA-TM-81325; A-8717) Avail: NTIS HC A02/MF A01 CSCL 05I

Pilot perceptions of glidepath angle and aim point were measured during simulated landings. A fixed-base cockpit simulator was used with video recordings of simulated landing approaches shown on a video projector. Pilots estimated the magnitudes of approach errors during observation without attempting to make corrections. Pilots estimated glidepath angular errors well, but had difficulty estimating aim-point errors. The data make plausible the hypothesis that pilots are little concerned with aim point during most of an approach, concentrating instead

on keeping close to the nominal glidepath and trusting this technique to guide them to the proper touchdown point. Author

N82-12773# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

HOW TO DISPLAY DIGITAL SONAR SIGNALS. SOME PRIMARY THRESHOLD MEASUREMENTS

A. vanMeeteren and A. F. Sanders 1979 20 p refs

(Contract A73/KM/032)

(IZF-1979-16; TDCK-73399) Avail: NTIS HC A02/MF A01

The optimal task division between operator and computer when trying to identify echos in sonar observation of a noisy field is discussed. Confidence ratings defined four criteria, ranging from sure no target to sure target, and results were scored as d values as a measure of detectability at the different criteria. The d values are higher towards the sure target end of the range. There are significant differences between subjects, but none for interactions between subjects and display variables. It is found that at high display thresholds the intensity mode works best, whereas at display the length mode is superior regarding target detection. Author (ESA)

N82-12774# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

CONSPICUITY OF OBSERVATION POSTS AT THE AIR WEAPON FIRING RANGES ON THE VLIEHORS AND THE NOORDVAARDER

J. Boogaard, J. Varkevisser, and J. J. Vos 1979 20 p ref Transl. into ENGLISH of 'Opvallendheid van observatieposten op de schietranges of de Vliehors en de Noordvarrder' Soesterberg, Netherlands

(Contract A78/KLu/058)

(IZF-1979-33-E; TDCK-73411) Avail: NTIS HC A02/MF A01

Visibility from the air of observation posts is examined in order to decrease the likelihood of their being mistaken for targets. Subjective assessments by tower personnel and pilots indicate that a yellow/black check pattern has no advantages for recognition. A scale model was used to test other color/pattern combinations and the effect of a marker beacon on the tower. Results show that: (a) visibility is improved by lights of 5 million cd, while higher values cause uncomfortable glare; (b) towers should be painted black; and (c) approach route must be clearly marked. However, tower staff fear that these measures will increase danger by making them too obvious a 'target', especially in poor visibility. Author (ESA)

N82-12775# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

CYBERNETICS AND CAR DRIVING: A MATHEMATICAL (COMPUTER) MODEL FOR THE SYSTEM TO BE CONTROLLED

G. J. Blaauw 1980 27 p refs

(IZF-1980-4; TDCK-75004) Avail: NTIS HC A03/MF A01

A mathematical representation of the system controlled by a car driver is presented. This system is defined by combinations of lateral and longitudinal vehicle dynamics, course following, and the execution of an arbitrary additional task. A linearized model is developed and implemented in subroutines on a digital computer. The model based on control theory uses state vector notation. The description results in a six-dimensional state vector and involves three lead variables (course of the road, velocity of the lead car and the stimulus of the additional task) and one disturbance variable (side-wind gusts or road irregularities). The routines calculate future values for the course of the road and the velocity of the lead car in order to make anticipation possible by the driver. Driver's actions are modeled by the position of the accelerator, the brake force and the steering wheel angle. Several routines are extended with additional procedures to allow for an independent use in other applications. For example, the mathematical representation of the vehicle dynamics is extended with nonlinear equations to cover the complete range of variables and can be used in specific studies of the effects of vehicle parameters. Author (ESA)

N82-12776# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

CYBERNETICS AND CAR DRIVING: A DRIVER MODEL AND ITS EXPERIMENTAL VALIDATION

G. J. Blaauw 1980 15 p refs

(IZF-1980-13; TDCK-75012) Avail: NTIS HC A02/MF A01

A linearized mathematical model which describes and predicts driver behavior is introduced. The internal representation consists of an estimation of the state vector describing the system to be controlled. The supervisory structure of the driver is studied by considering lateral and longitudinal control, combined with variations in bandwidth and energy of the lead variables. Car following and course following are included so that driver anticipation can be modeled by the observation of future values of the course of the road and the lead car velocity. A lead variable for the stimulus of an additional task can be included. Model validity is demonstrated by analyzing the effects of variables, (driving experience, system disturbances, etc.) on the model parameters. Author (ESA)

N82-12777# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

LEVELS OF STEERING CONTROL: REPRODUCTION OF STEERING WHEEL MOVEMENTS

J. Godthelp 1980 36 p refs

(IZF-1980-16; TDCK-75014) Avail: NTIS HC A03/MF A01

A schematic description of the driving control process using levels of control, i.e., precognitive, pursuit, and compensatory, is presented. The efficiency of the higher levels of control depends on the accuracy of internal information (knowledge of the road, the car, etc.) plus proprioceptive feedback. The sensitivity of the proprioceptive system was analyzed by measuring subjects' accuracy when asked to reproduce steering wheel positions without visual feedback. For discrete positions, standard deviation increases with steering wheel angle amplitude. However, relative errors are greatest with small angles. Steering force reduces the variation in reproduction. For continuous movements, reproductions are less accurate with low movement velocity than for the discrete positions. An additional velocity overshoot occurs. Rapid movements show higher positioning accuracy than slow.

Author (ESA)

N82-12778# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

CYBERNETICS AND CAR DRIVING: PERSPECTIVE PERCEPTION AND THE OUTPUT VECTOR OF THE SYSTEM TO BE CONTROLLED

G. J. Blaauw 1980 22 p refs

(IZF-1980-19; TDCK-75008) Avail: NTIS HC A02/MF A01

A sensitivity analysis for the perspective perception of lateral position variations during course following and distance variations during car following is covered. Variations in the curvature of the road followed are also considered via a perspective transformation. The sensitivities are derived for the development of a cybernetical model to describe and predict driver behavior quantitatively. The curvature variations are related to the most substantial element of the lead vector. The sensitivity for lateral position variations distinguishes between guidance features (lane markers, postmounted delineators, public lighting, etc.). The sensitivities for distance variations are related to the angular perception of the lead car dimensions and the road interval between lead car and own vehicle. The derived transformation equations are combined into one display equation which represents the transformation of the variables involved in the system to be controlled and models the output vector of that system as input information for the driver. Author (ESA)

N82-12779# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE EFFICIENCY OF DETECTING TRIBAR PATTERNS MODULATED IN RANDOM DOT DENSITY

R. T. Flaherty (Night Vision and Electro-Optics Labs.) and A. VanMeeteren 1980 15 p refs

(IZF-1980-25; TDCK-75020) Avail: NTIS HC A02/MF A01

The ability of the visual system to resolve detail, and to integrate information over area in threshold measurements with tribar targets is examined. Frequency-of-seeing curves were measured for the detection of tribar patterns modulated in the density of computer generated random dot distributions. Comparison of actual and ideal results shows that the visual system uses only 22% of the available information in detecting tribar targets. For long presentation times of 1 sec no difference

in efficiency is found for targets of 1 deg X 1 deg and 10 deg X 10 deg. However, for short presentation times of 0.2 sec, the efficiency is about 40% lower for the 10 deg targets. This suggests that the field of view for pattern integration in one glimpse is smaller than 10 deg X 10 deg. Contrast sensitivity functions measured with tribar targets comprise a component for spatial integration inversely proportional to spatial frequency.
Author (ESA)

N82-12780# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France). Inst. fuer Flugmechanik.
REVIEW OF HUMAN AND OPERATIONAL FACTORS AFFECTING THE FEASIBILITY OF THE SEE-AND-AVOID CONCEPT
Otto Weber May 1981 52 p refs
(DFVLR-Mitt-81-13) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 12.30

Theoretical analysis and flight test assessments of the see-and-avoid concept of accident prevention are discussed. The international definition of visibility is supplemented by maximum detection range (MDR) and horizontal standard visibility (HSV). The MDR is always significantly lower than the HSV. Representations from design eye reference points show that cockpit visibility is often poor, especially for light, and small jet, aircraft when flying a horizontal turn. The introduction of speed dependent visual flight regulations is recommended. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-12781 Pennsylvania State Univ., University Park.
CLOSE-RANGE CINE-PHOTOGRAMMETRY: A GENERALIZED TECHNIQUE FOR QUANTIFYING GROSS HUMAN MOTION Ph.D. Thesis
James Stephen Walton 1981 648 p
Avail: Univ. Microfilms Order No. 8120471

New cinematographic techniques for performing two and three dimensional analyses are described. Transformations between object coordinates and image coordinates were developed. The techniques are similar to those employed in analytical photogrammetry. Applications of the generalized three dimensional technique require information from a minimum of two distinct views. Applications of the generalized planar technique can e made using information from a single camera. A refined version of the generalized three dimensional technique is also described. This corrects for lens distortions and linear film deformations. It is shown that, using object distances of approximately 35 feet, the center of a golf ball can be located to within .1 inch of its true, three dimensional location. The acceleration of the center of mass of a spinning, yet freely falling frampolinist is determined and compared with the acceleration due to gravity.
Dissert. Abstr.

N82-12782*# Ohio State Univ., Columbus.
AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS. VOLUME 1: EXECUTIVE SUMMARY Final Report
Thomas H. Rockwell and Walter C. Griffin [1981] 199 p refs (Contracts NAS2-10047; NAG2-75)
(NASA-CR-164993) Avail: NTIS HC A09/MF A01 CSCL 05H

Critical in-flight events (CIFE) that threaten the aircraft were studied. The scope of the CIFE was described and defined with emphasis on characterizing event development, detection and assessment; pilot information requirements, sources, acquisition, and interpretation, pilot response options, decision processed, and decision implemetation and event outcome. Detailed scenarios were developed for use in simulators and paper and pencil testing for developing relationships between pilot performance and background information as well as for an analysis of pilot reaction decision and feedback processes. Statistical relationships among pilot characteristics and observed responses to CIFE's were developed. R.J.F.

N82-12783*# Ohio State Univ., Columbus.
AN INVESTIGATION INTO PILOT AND SYSTEM RESPONSE TO CRITICAL IN-FLIGHT EVENTS. VOLUME 2: APPENDIX
Thomas H. Rockwell and Walter C. Griffin [1981] 150 p refs
(Contracts NAS2-10047; NAG2-75)
(NASA-CR-164994) Avail: NTIS HC A07/MF A01 CSCL 05H

Materials relating to the study of pilot and system response to critical in-flight events (CIFE) are given. An annotated bibliography and a trip summary outline are presented, as are knowledge surveys with accompanying answer keys. Performance profiles of pilots and performance data from the simulations of CIFE's are given. The paper and pencil testing materials are reproduced. Conditions for the use of the additive model are discussed. A master summary of data for the destination diversion scenario is given. An interview with an aircraft mechanic demonstrates the feasibility of system problem diagnosis from a verbal description of symptoms and shows the information seeking and problem solving logic used by an expert to narrow the list of probable causes of aircraft failure. R.J.F.

N82-12784# Naval Air Development Center, Warminster, Pa.
ANTI-EXPOSURE TECHNOLOGY IDENTIFICATION FOR MISSION SPECIFIC OPERATIONAL REQUIREMENTS Final Report
Suzanne M. Reeps, David C. Johanson, and Louis J. SantaMaria 8 Aug. 1981 113 p refs
(AD-A105070; NADC-81081-60) Avail: NTIS HC A06/MF A01 CSCL 06/17

A selected group of anti-exposure garment configurations have been evaluated at the Naval Air Development Center to determine their comparative levels of performance in the areas of mobility/reach, heat stress/comfort, and immersion hypothermia protection. The specific results of these evaluations are reported, as well as a discussion of how the results relate to the U.S. Navy Operational Requirements for cold water exposure protection, as currently specified by the CNO. GRA

N82-12785# ILC Industries, Inc., Dover, Del. Protective Equipment Div.
ZIPPER REAR CLOSURE ENDURANCE TESTING Final Report, 14 Apr. - 14 Jul. 1981
Charles R. Sandy 14 Jul. 1981 6 p refs
(Contract DAAK11-79-C-0066)
(AD-A104732) Avail: NTIS HC A02/MF A01 CSCL 06/17

A manned endurance test program of 22 two hr. tests was conducted to verify the reliability of the DPE Outergarment Zipper Rear Closure developed under task order nine of this contract. Testing indicates that the closure assembly reliably provides a positive seal in the rear of the Outergarment as it is actually worn and used. Author (GRA)

N82-12786# Systems Technology, Inc., Hawthorne, Calif.
USER'S GUIDE TO BIODYN-80: AN INTERACTIVE SOFTWARE PACKAGE FOR MODELING BIODYNAMIC FEEDTHROUGH TO A PILOT'S HANDS, HEAD AND EYES Final Report, Jan. 1979 - Oct. 1980
Susan A. Riedel, Raymond E. Magdaleno, and Henry R. Jex Jul. 1981 70 p refs
(Contract F33615-79-C-0519; AF Proj. 2312)
(AD-A104933; STI-TR-1146-1) Avail: NTIS HC A04/MF A01 CSCL 06/6

An interactive computer program (BIODYN-80) for solving the dynamic motion response of seated aircrew (pilots or equipment operators) working in a biodynamic environment (such as vibration or changing levels of acceleration in aircraft, surface vehicles, or motion simulators) is described. The multi-degree-of-freedom, lumped-parameter model includes elements for: pelvis, torso, neck, head, eyes, upper and lower arms, hand-grip and control stick (center-stick with arm rest). The nonlinear equations of motion of the body's main elements are linearized about a general set of body-limb-head postures, ranging from prone, to erect, to supine. Typical parameter ranges and sources are

given, along with two 'typical' sets: a seated-pilot with center-stick, and a seated produce biomechanical transmissability files needed for use in the Air Force's PIVIB program for tracking performance estimation. Procedures and examples are given for both a Cyber 175 version and a PDP-10 version. GRA

N82-12787# Nederlands Inst. voor Praeventieve Gezondheidszorg TNO, Leiden.
HUMAN CONTROL AND REGULATION TASKS [MENSELIJKE STUUR-EN REGELTAKEN]
C. L. Ekkers, A. A. F. Brouwers, C. K. Pasmooij, and P. M. deVlaming Delft Netherlands Organization for Applied Scientific Research TNO Sep. 1980 246 p refs In DUTCH
Avail: NTIS HC A11/MF A01

The effects of technological development, defined as automation, on the nature and quality of human work in industrial process control systems and computer systems were investigated. Twenty four man machine systems with different degrees of automation and complexity were compared for characteristics of technical, organizational and individual tasks. It is noted that sharing of tasks between man and machine is more unfavorable at higher levels of automation. The operator's abilities are only occasionally utilized and the opportunity to do meaningful work is limited. Teamwork is more positive, but it llimits the individual operator's autonomy, even more in highly automated systems. In administrative computer systems, the routine nature of the work and its rigid procedures are considered negative. A clear correlation is found between these problems, job satisfaction and sickness rate. Author (ESA)

N82-12788# Engins Matra, Velizy (France).
METHODICAL STUDY OF THE CONTRIBUTION OF THE HUMAN SYSTEM TO THE INSECURITY OF TECHNOLOGICAL SYSTEMS [ETUDE METHODIQUE DE LA CONTRIBUTION DU SYSTEM HUMAIN A L'INSECURITE DES SYSTEMES TECHNOLOGIQUES]
J. L. Deschamps 1981 18 p In FRENCH
Avail: NTIS HC A02/MF A01

The use of probability studies to increase system safety is advocated. The danger of overlooking human error when attributing blame for the failure of a piece of equipment is emphasized. The links between professional competence and physical and mental health are pointed out. It is recommended that serious accidents should be analyzed in terms of: the industry (petrochemical, construction, etc.); production unit (number of employees, foremen, etc.); job description; trades of persons involved; individual characteristics of persons involved (age, education, etc.); and the scenario (time, place, etc.).
Author (ESA)

N82-12789# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY, NO. 128
23 Sep. 1981 49 p Transl. into ENGLISH from various Chinese articles
(JPRS-79047) Avail: NTIS HC A03/MF A01

The state of the art in science and technology in the Chinese Peoples Republic is reported. Abstracts dealing with the following topics are presented: (1) applied sciences; (2) publications; (3) civil engineering; (4) electronics; (5) geography; (6) internal combustion engine engineering; (7) nuclear physics; (8) petroleum science; (9) solar energy; and (10) transportation modernization. For individual titles, see N82-12790 through N82-12790.

N82-12790# Joint Publications Research Service, Arlington, Va.
EQUIPMENT DESIGN MUST INCORPORATE EASE OF OPERATION
Xiong Jiayu *In its* China Rept.: Sci. and Technol., No. 128 (JPRS-79047) 23 Sep. 1981 p 1-6 Transl. into ENGLISH from Gongcheng Jixie (Tianjin), no. 6, 1981 p 30-33 (For primary document see N82-12789 03-54)
Avail: NTIS HC A03/MF A01

Essential factors in the design of construction machines and equipment are: (1) height of operating installation; (2) vision; (3) hearing; and (4) force required for operation. Topics discussed include adaptation to brightness and darkness, color discrimination, auditory threshold, exercise physiology, reaction time and dexterity. E.A.K.

N82-12129*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CREW ACTIVITIES IN SPACE
Guion S. Bluford, Jr. *In* NASA. Marshall Space Flight Center Spacecraft Dyn. as Related to Lab. Expt. in Space Nov. 1981 p 181-187 (For primary document see N82-12109 03-18)
Avail: NTIS HC A10/MF A01 CSCL 05H.

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N82-12791 California Univ., San Diego.
OPTIMAL SYNCHRONIZATION FOR A DISTRIBUTED DATABASE Ph.D. Thesis
Robert Joel Hofkin 1981 133 p
Avail: Univ. Microfilms Order No. 8120528

A protocol for the synchronization of transactions in a distributed database management system is described. This protocol, called GUS, uses a completely distributed control mechanism, and guarantees the equivalent of a first-come, first-served order of transaction processing. Two measures of communication costs: the number of messages sent, and the time delay in transmission, are used to evaluate the performance of synchronization protocols. The GUS is compared to several other protocols used in distributed database sytems, and also to the theoretical lower bounds for the two costs. In the best case, GUS achieves both lower bounds. The GUS is always faster, and requires fewer messages than the other distributed synchronization protocols. The basic GUS protocol uses no acknowledgement messages, but instead relies upon characteristics of the communication medium to achieve improved performance. The problem of communication and site failure is reviewed. Interprocess communication is abstracted by a local capability model; this model facilitates the design of distributed systems using standard finite-state analysis. Dissert. Abstr.

N82-12792 Rutgers - The State Univ., New Brunswick, N. J.
NUMERICAL EXPERIMENTS FOR SOLVING SYMMETRIC HYPERBOLIC SYSTEMS WITH DISCONTINOUS INITIAL DATA Ph.D. Thesis
Yi-Ling Fan Chiang 1981 264 p
Avail: Univ. Microfilms Order No. 8122058

Numerical experiments were performed to observe the rate of weak convergence in applying difference schemes to linear, symmetric, hyperbolic problems with discontinuous initial data.

At a fixed time, the discrete solution as a function of the space variable may be viewed as decomposed into adjacent smooth regions and neighborhoods of discontinuity. In the smooth regions, the rate of convergence is the order of the scheme and is independent of the preprocessing technique. In the neighborhoods of discontinuity, for problems with constant coefficients, the rate of convergence is the minimum order to the employed scheme and the preprocessing technique. For problems with variable coefficients, the expected rate of convergence was never observed. Within reasonable limits on the mesh size, the asymptotic behavior of the solution is not achieved. Furthermore, the characteristic speed plays an important role in both the rate of convergence and the accuracy of the approximation. The measure of the L sub 2-underestimate is also studied. Dissert. Abstr.

N82-12793# RAND Corp., Santa Monica, Calif.
DEFERRING UPDATES IN A RELATIONAL DATA BASE SYSTEM
Stephanie Cammarata Jun. 1981 26 p refs Presented at the 7th Intern. Conf. on Very Large Data Bases, France, Sep. 1981; sponsored by the Inst. National de Recherche en Informatique et en Automtique
(P-6634) Avail: NTIS HC A03/MF A01

Deferred updating in a relational data base is a technique which delays the application of updates until a request is made for the value. In general we do not know, a priori, which of the updated values will be retrieved; therefore; it is beneficial to defer the access and computation. This technique promotes an 'update-by-need' policy. The method uses generalization, property inheritance, and procedural attachment for dynamically maintaining the update and query processes. The use of these representational concepts aids in maintaining the structure of the relational model, yet provides opportunities to extend the semantic power of the model. Author

N82-12794*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLAS EDITING PROCEDURES FOR THE FGGE LEVEL II-B DATA COLLECTED DURING SOP-1 AND 2
W. Baker, D. Edelmann, and H. Carus Sep. 1981 30 p refs
(NASA-TM-83811) Avail: NTIS HC A03/MF A01 CSCL 09B

The modifications made to the FGGE Level II-b data are discussed and the FORTRAN program developed to perform the modifications is described. It is suggested that the edited database is the most accurate one available for FGGE SOP-1 and 2.
E.A.K.

N82-12795# National Aerospace Lab., Tokyo (Japan).
NEW SCHEDULER FOR JOB PROCESSING IN COMPUTER SYSTEMS
Masako Tuchiya, Kazuyo Suematsu, Masahiro Yoshida, and Shigeki Hatayama 1981 60 p refs In JAPANESE; ENGLISH summary
(NAL-TR-659; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

The job processing method in computer systems is discussed. The conventional scheduler is criticized and it is pointed out that utilization of the central processing unit (CPU) is too sensitive to the input job-stream. This is the reason it is difficult to retain constantly high CPU utilization in keeping with the increasing throughput of the short job-class. A job processing method to solve this problem, the job/job-step scheduler, is proposed. The main concept is to schedule a job or a job-step so that a number of so-called CPU-bound job-steps may be in a state for immediate processing by CPU. In order to make the new scheduling possible, the operating systems must have the following job-processing capability: all job-steps setting up the job shall not necessarily be processed sequentially; it should be possible to halt the job processing temporarily at some job-step stage for preparation of the pool of CPU-bound job-steps. The skeleton of the simulator which was programmed to evaluate the performance of the job/job-step scheduler in an application for job processing with the NAL computer system is described. The results of the simulation experiment are given to illustrate the effectiveness of the proposed scheduler. B.W.

N82-12796*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
HARDWARE SURVEY FOR THE AVIONICS TEST BED
J. M. Cobb Jun. 1981 77 p
(Contract NAS9-15800)
(NASA-CR-161072; JSC-17451; LEMSCO-16838) Avail: NTIS HC A05/MF A01 CSCL 09B

A survey of major hardware items that could possibly be used in the development of an avionics test bed for space shuttle attached or autonomous large space structures was conducted in NASA Johnson Space Center building 16. The results of the survey are organized to show the hardware by laboratory usage. Computer systems in each laboratory are described in some detail. R.J.F.

N82-12797# Naval Postgraduate School, Monterey, Calif.
HARDWARE AND SOFTWARE IMPROVEMENTS TO A PACED DATA ACQUISITION SYSTEM FOR TURBOMACHINES M.S. Thesis
Patrick Anthony McCarville Jun. 1981 70 p refs
(AD-A104853) Avail: NTIS HC A04/MF A01 CSCL 09/2

Modification of the phase lock loop synchronizing circuits and of the method of input/output communication used in a synchronized data sampling system are reported. A device known as PACER which used an analog phase lock loop for synchronization and produced a nonlinar set of synchronizing pulses, was modified to use a CMOS digital phase lock loop, resulting in a linear set of pulses. A user's manual for paced data acquisition is included. T.M.

N82-12798# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
NONLINEAR REAL-TIME OPTICAL SIGNAL PROCESSING Final Report, 14 Apr. 1977 - 14 Apr. 1981
A. A. Sawchuk, T. C. Strand, and A. R. Tanguay, Jr. 30 Jun. 1981 84 p refs
(Grant AF-AFOSR-3285-77; AF Proj. 2305)
(AD-A105186; USCIPI-1020; AFOSR-81-0650TR) Avail: NTIS HC A05/MF A01 CSCL 14/5

The results of a four year research program in nonlinear real time optical signal processing are described. The goal of the program was to extend fast parallel nonlinear operations to optical processing systems with large time bandwidth and space bandwidth products. Real time homomorphic and logarithmic filtering by halfonte nonlinear processing has been achieved. A detailed analysis of degradation due to the finite gamma and other nonideal effects of the recording medium has been completed along with an extensive study of techniques for precompensating these effects. Further improvements in experimental work await a liquid crystal light valve (LCLV) or other real time spatial light modulator with a sharper threshold and better uniformity and repeatability. A direct nonlinear technique of real time parallel A/D conversion of an incoherent optical image has been developed. A detailed theoretical analysis and modeling of liquid crystal devices and associated photoconductors was completed, providing an excellent fit to experimental data obtained on several devices provided by Hughes Research Laboratories. These results have been used to make a flexible multiple light valve system (MLVS) in which the form of the nonlinearity can be varied.
GRA

N82-12799# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THINKING ABOUT LOTS OF THINGS AT ONCE WITHOUT GETTING CONFUSED: PARALLELISM IN ACT 1
Henry Lieberman May 1981 24 p refs
(Contracts N00014-75-C-0522; N00014-80-C-0505)
(AD-A104965; AI-M-626) Avail: NTIS HC A02/MF A01 CSCL 06/4

As advances in computer architecture and changing economics make feasible machines with large-scale parallelism, Artificial Intelligence will require new ways of thinking about computation that can exploit parallelism effectively. We present the actor model of computation as being appropriate for parallel systems, since it organizes knowledge as active objects acting independently, and communicating by message passing. We describe the parallel constructs in our experimental actor interpreter Act 1. Futures create concurrency, by dynamically allocating processing

resources much as Lisp dynamically allocates passive storage. Serializers restrict concurrency by constraining the order in which events take place and have changeable local state. Using the actor model allows parallelism and synchronization to be implemented transparently, so that parallel or synchronized resources can be used as easily as their serial counterparts.
Author (GRA)

N82-12800# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
SOLUTION OF NONLINEAR STRUCTURAL PROBLEMS USING ARRAY PROCESSORS
Nesrin Sarigul, Jacek Maitan, and Hussein Kamel 20 Aug. 1981 30 p refs Presented at 1981 FENOMECH, Stuttgard, 25-28 Aug. 1981
(Contract N00014-75-C-0837; NR Proj. 064-531)
(AD-A104987; TR-8) Avail: NTIS HC A03/MF A01 CSCL 09/2

The paper describes ongoing efforts to investigate the usefulness of so called 'attached processors' or 'array processors', combined with mini-and superminicomputers, in the analysis of computationally demanding engineering problems; such as, in finite element nonlinear applications. A close examination of some basic algorithms, which play an important part in such analysis, is presented. Furthermore, a methodology is developed, which forms a useful guide to further efforts of this nature, including the more general case of multiprocessing. An emphasis is made on the ability to predict the performance of algorithms from time measurements of certain basic operations, coupled with an understanding of the characteristics of the hardware in question and the interplay between its various components. Four hardware alternatives are considered, two of which have attached array processors. Of the algorithms considered, it appears that the decomposition process is the one which benefits most from the presence of an array processor. The speed advantage gained in stiffness assembly, and forward and backward substitution may both be obtained by purchasing a more powerful superminicomputer.
Author (GRA)

N82-12801# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
UNIX NSW FRONT END ENHANCEMENTS, VOLUME 1 Final Technical Report, Jan. - Oct. 1980
Robert H. Thomas, Hendrik O. Lind, and Stephen G. Toner Griffiss AFB, N.Y. RADC Jun. 1981 203 p refs
(Contract F30602-80-C-0062; AF Proj. 5581)
(AD-A105035; BBN-4571-Vol-1; RADC-TR-81-164-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 09/2

The effort to develop a UNIX NSW Front End is part of the National Software Works (NSW) program sponsored jointly by the Air Force and ARPA. The goal of the NSW program is to develop a network operating system (called the NSW system or NSW for short) that provides an effective environment for software production, software configuration control, and software maintenance. Users access the National Software Works system by means of an NSW Front End. The objective of the UNIX NSW Front End project was to develop an NSW Front End that runs on a DEC PDP-11 computer under the UNIX operating system.
Author (GRA)

N82-12802# Oak Ridge Gaseous Diffusion Plant, Tenn. Dept. of Analytical Chemistry.
DEVELOPMENT OF ELEMENTAL ANALYZER TO PROGRAMMABLE CALCULATOR INTERFACE
Fred W. Postma, Jr. Sep. 1981 58 p refs
(Contract W-7405-eng-26)
(DE82-000895; K-2026) Avail: NTIS HC A04/MF A01

A solid state electronic interface was designed and constructed. It relieved the analyst of the responsibility for measuring changes in the pen position on the strip chart and for performing the calculations during the analysis and weighting period. A program was written to calculate blanks, standard factors, and sample weight fractions for nitrogen, carbon, and hydrogen. The interface passed data from a Pepkin-Elmer Elemental Analyzer to a Texas Instruments TI Programmable 59 pocket calculator and printer.
DOE

N82-12803# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
DEVELOPMENT OF MOS MEMORIES Final Report
Hans Moormann, Helmut Mueller, Adolf Scheibe, Jacobus Scholtens, and Hartmut Schrenk Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 220 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-161; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38,50

The designs were adjusted to the production process in such a way that modules with higher reliability and performance can be manufactured. Key technology developments were: the double-poly-Si technique, the varactor MOS technique, and the floating gate technique. Two of the memories are high density 16 Kbit and 64 Kbit random access memories. Three are nonvolatile unprogrammable memories: a 256 bit television station memory, an 8 Kbit electrically alterable read-only memory (ROM) and a 16 Kbit optically erasable ROM. Three are ROM's with 8, 16 and 32 Kbits.
Author (ESA)

N82-12804# Hamburg Univ. (West Germany). Fachbereich Informatik.
BENORSY: A FORMALIZED INSTRUMENT FOR THE USER ORIENTED REVISION OF DP-SYSTEMS Final Report
Heidrun Essig, Hanns-Wilhelm Heibey, Michael Kuehn, and Arno Wolf Bonn Bundesministerium fuer Forschung und Technologie Jan. 1981 190 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-81-001; ISSN-0170-9011) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35,30

User studies in data processing and social sciences are reviewed. The approach is based on two equally necessary assumptions for user oriented data processing systems: (1) a framework for user interactive systems, showing the problem areas important to the user and forming a foundation for technical oriented design instruments; and (2) user participation helping with this framework in practice. BENORSY, consisting of ANALYZE which determines the causes of low user compatibility and BESCHREIBUNG which describes the actual and desired situation of computer aided work systems transparently, was implemented in a participative project organization.
Author (ESA)

N82-12805# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
DATA FLOW AND BUS STRUCTURE IN A LOOSELY COUPLED MULTIPROCESSOR COMPUTER SYSTEM ARCADE
Ruben Gonzalez-Rubio and Gilles Allard Mar. 1981 19 p refs Presented at Euromicro 81, 8-10 Sep. 1981
(ENST-C-81003) Avail: NTIS HC A02/MF A01

The data flow for system operation and bus structure of ARCADE, a loosely coupled multiprocessor with two multiple nondedicated bus systems, is presented. Interprocessor communication is treated. System architecture, consisting of sets of dedicated processors, is decribed. The APL language is used. It allows system operation to be divided into two modes, definition and execution. The system is still in the experimental construction phase.
Author (ESA)

N82-12806# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
EFFICIENT IMPLEMENTATIONS OF MULTICOUNTER MACHINES FOR OBLIVIOUS TURING MACHINES, ACYCLIC LOGIC NETWORKS, AND VLSI
P. M. B. Vitanyi May 1981 24 p refs Submitted for publication
(MC-IW-167/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

The dependence of the required time and storage, to maintain counts, on storage structure and organization as well as the cost required by a combinatorial network are investigated. Results show that a one-tape oblivious Turing machine can simulate a k-counter machine on-line in linear time and logarithmic space. This leads to a linear cost combinational logic network implementing n steps of a k-counter machine. In the VLSI model of computation it is possible to simulate n steps of a k-counter

machine in real time on area Omicron (k log n). A k-counter machine can be simulated in real time by a nonoblivious machine without head reversals. Results are also stated for oblivious k-counter languages. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-12807 Carnegie-Mellon Univ., Pittsburgh, Pa.
EVALUATION OF MICROPROCESSORS FOR PROCESS CONTROL APPLICATIONS Ph.D. Thesis
Thomas Edgar Dickey 1981 484 p
Avail: Univ. Microfilms Order No. 8118789

A procedure is developed for rating different microprocessors in terms of the relative difficulty of programming them for the same process control application in assembly language. The procedure is based on measuring the logical complexity of each microprocessor's instruction repetoire. A simple experiment is performed to test this procedure by programming a set of five kernel programs which are representative of typical tasks performed in a digital process control system. These kernel programs were coded for six different commercially available microprocessors. The kernel program development time and the complexity measure are very strongly correlated. Dissert. Abstr.

N82-12808 Kentucky Univ., Lexington.
DYNAMIC PROGRAMMING FOR PROBLEMS OF IMPULSE CONTROL Ph.D. Thesis
Armand Maurice Makowski 1981 255 p
Avail: Univ. Microfilms Order No. 8121612

The ideas and techniques are illustrated on two typical samples, namely a general problem of optimal stopping and a problem of inventory control with jump process input. The emphasis is on obtaining local necessary and sufficient optimality conditions; they take the form of a generalized (quasi-) variational inequality associated with the weak infinitesimal generator of a semigroup of conditioned shifts, generated by the flow of information. The analysis revolves around the study of a quantity--the auxiliary value function--which completely characterizes optimality and is differentiable in some semigroup sense. For both problems investigated, this differentiability is directly established by computing various Lipschitz-like estimates for the auxiliary value function. Dissert. Abstr.

N82-12809 George Washington Univ., Washington, D.C.
SISU: A PROGRAMMING LANGUAGE FOR COMPUTATIONAL LINGUISTICS, WITH AN APPLICATION TO THE ANALYSIS OF FINNISH Ph.D. Thesis
Irving David Woolf 1981 422 p
Avail: Univ. Microfilms Order No. 8118659

A programming language for Computational Linguistics (CL), is described. Natural-language processing and CL application areas and examples are examined to develop a list of requirements for such a programming language. The SISU language was developed to meet those requirements. A large number of features to simplify the construction of CL are provided. Command and data abstractions to facilitate handling blocks of text, sentences and words by referring to them as just that-text, sentences and words are reviewed. A number of commands which operate on individual words for the purpose of morphemic analysis, allowing the words to be easily taken apart, examined and altered are provided. A facile dictionary-building and referencing technique is also included, as well as debugging and text output features. Dissert. Abstr.

N82-12810 Rutgers - The State Univ., New Brunswick, N. J.
SINGULAR PERTURBATION MODELING AND ITS APPLICATION TO FAST ALGORITHMS OF CHANDRASEKHAR TYPE Ph.D. Thesis
George Panayiotou Syrcos 1981 153 p
Avail: Univ. Microfilms Order No. 8122132

The state equations of a large scale, time invariant model are converted to singularly perturbed form. Classification of the physical states as slow and fast is accomplished. The use of the Chandrasekhar algorithm in a singularly perturbed type of environment is addressed. A Chandrasekhar algorithm for singularly perturbed systems is developed and the structure of the solution is analyzed. The developd theory is applied to the design of the linearized F-100 turbofan engine. Dissert. Abstr.

N82-12811 Rutgers - The State Univ., New Brunswick, N. J.
RESTRUCTURING COBOL PROGRAMS TO IMPROVE READABILITY Ph.D. Thesis
Bobbie Ann Fredsall Othmer 1981 229 p
Avail: Univ. Microfilms Order No. 8122108

The problem of restructing programs for enhanced readibility from both a theoretical and empirical point of view is examined. Program readability is defined in terms of the information processing model of memory. In order to evaluate the efficacy of the restructuring algorithms presented, a six component readability measure is developed. Program structures and rules for the use of control structures advocated by adherents of structured programming are considered in choosing a form for the target of the restructuring process. Four forms were chosen for examination. They all use the repeat-loop with multilevel exists as the loop control structure. Restructuring algorithms for achieving each form from a control flow graph are presented. For a given program, the restructured version is unique or almost unique if certain desirable properties are required. The uniqueness is independent of the algorithm used for restructuring, and thus restructuring using only syntactic information has intrinsic limitations. Examples of the restructuring of several production programs are given. Dissert. Abstr.

N82-12812 University of Southwestern Louisiana, Lafayette.
DESIGN AND CONSTRUCTION OF A VIRTUAL MACHINE RESOURCE BINDING LANGUAGE Ph.D. Thesis
Scott Davidson 1980 254 p
Avail: Univ. Microfilms Order No. 8121477

A machine independent solution of the resource binding problem, a high level language incorporating this solution, the implementation of this language, and experiments conducted with the language are investigated. The Virtual Machine Resource Binding Language (MARBLE) solves the resource binding problem. The implementation of MARBLE is designed for the class of microprogrammable architectures. The solution to the resource binding problem consists of modelling target virtual machine resources by machine independent source language constructs. In MARBLE target data resources are modelled by type definitions. These models can be bound to the appropriate target resource through the use of a source language construct. All MARBLE programs are machine independent. Dissert. Abstr.

N82-12813*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VELOCITY-SPACE SYNTHESIS OF ISEE-1 MEASUREMENTS OF THE THREE DIMENSIONAL ELECTRON DISTRIBUTION FUNCTION
R. J. Fitzenreiter and Jack D. Scudder Oct. 1981 37 p refs (NASA-TM-83838) Avail: NTIS HC A03/MF A01 CSCL 09B

A computer package which produces contour plots of the three dimensional electron distribution function measured by an electron spectrometer aboard ISEE-1 is described. Examples of the contour plots and an explanation of how to use the program, including the necessary computer code for running the program on the GSFC 360/91 computer is presented. The method by which the discrete measurements of the distribution function, given by points on the four dimensional surface are synthesized into a smooth surface in a three dimensional space which can be contoured is described. The velocity components are parallel and perpendicular to the magnetic field, respectively, in the proper frame of the electrons. S.L.

N82-12814# National Aerospace Lab., Tokyo (Japan).
TRANSONIC AIRFOIL DESIGN OF FULL POTENTIAL FLOW. 2: DEVELOPMENT OF THE FORTRAN CODE
Tomiko Ishiguro, Nobuhiko Kamiya, Nobuhiro Kawai, and Keiko Oguchi 1981 97 p refs In JAPANESE; ENGLISH summary (NAL-TR-673; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

A user's manual for the FORTRAN program is presented which is coded following the numerical procedure developed for design of transonic airfoils. This program can solve the inverse problem irrespective of the presence of shock waves. The airfoil geometry is designed so that the width of the trailing edge is the required one. The boundary layer calculation is included in a procedure whereby an actual airfoil geometry is obtained by subtracting a displacement thickness of a boundary layer from an airfoil geometry. R.J.F.

N82-12815*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

USE OF AN ENGINEERING DATA MANAGEMENT SYSTEM IN THE ANALYSIS OF SPACE SHUTTLE ORBITER TILES

Gary L. Giles and Maria Vallas Oct. 1981 13 p refs Presented at the AIAA Computers in Aerospace 3rd Conf., San Diego, Calif., 26-28 Oct. 1981

(NASA-TM-83215) Avail: NTIS HC A02/MF A01 CSCL 09B

The use of an engineering data management system to facilitate the extensive stress analyses of the space shuttle orbiter thermal protection system is demonstrated. The methods used to gather, organize, and store the data; to query data interactively; to generate graphic displays of the data; and to access, transform, and prepare the data for input to a stress analysis program are described. Information related to many separate tiles can be accessed individually from the data base which has a natural organization from an engineering viewpoint. The flexible user features of the system facilitate changes in data content and organization which occur during the development and refinement of the tile analysis procedure. Additionally, the query language supports retrieval of data to satisfy a variety of user-specified conditions. S.L.

N82-12816# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

RECOGNIZE REGULAR LANGUAGES WITH PROGRAMMABLE BUILDING BLOCKS Interim Report

M. J. Foster and H. T. Kung 19 Jun. 1981 13 p refs

(Contracts N00014-80-C-0236; F33615-78-C-1551)

(AD-A104874; CMU-CS-81-126) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper introduces a new programmable building-block for recognition of regular languages. By combining three types of basic cells a circuit for recognizing any regular language can be constructed or 'programmed' automatically from the regular expression describing that language. Recognizers built in this way are efficient pipeline circuits that have constant response time and avoid broadcast. In addition, the paper proposes the use of a single, regular layout, called the PRA (programmable recognizer array), that can be 'personalized' to recognize the language specified by any regular expression. PRA's provide compact reconfigurable layouts for recognizer circuits, requiring only O(n log n) area for regular expressions of length n.

Author (GRA)

N82-12817# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

USING PROGRAM TRANSFORMATIONS TO DERIVE LINE-DRAWING ALGORITHMS

Robert F. Sproull Apr. 1981 19 p refs

(Contract F33615-78-C-1551; ARPA Order 3597)

(AD-A104873; CMU-CS-81-117) Avail: NTIS HC A02/MF A01 CSCL 09/2

A wide variety of line-drawing algorithms can be derived by applying program transformations to a simple, obviously correct algorithm. The transformations increase the algorithm's performance and eliminate the need for floating-point computations. Two familiar algorithms are derived in this way: Bresenham's algorithm and the digital differential analyzer (DDA). The transformations are then used to derive several highly parallel variants of Bresenham's algorithm, designed for use on displays that can generate more than one pixel at a time. The treatment shows a complete, extended example of the practical use of program transformations. Moreover, the transformations derive Bresenham's algorithm without recourse to complex geometric arguments. Author (GRA)

N82-12818# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

MINIMIZING COMPUTATIONAL COST FOR DYNAMIC PROGRAMMING ALGORITHMS

A. Waibel, N. Krishnan, and R. Reddy 17 Jun. 1981 25 p refs

(Contract F33615-78-C-1551; Grant NSF MCS-78-25824; ARPA Order 3597)

(AD-A104792; CMU-CS-81-124) Avail: NTIS HC A02/MF A01 CSCL 09/2

In this study we introduce and test several methods to reduce the computational cost in dynamic programming algorithms for isolated word recognition systems. Three methods will be discussed in detail: (1) pruning by preset thresholds; (2) search based on the Branch and Bound technique; (3) branch and Bound based search with additional pruning. Compared to conventional algorithms, Method 3 could be seen to yield a speed up of approximately a factor of 5, at no loss of recognition accuracy. The branch and bound method with pruning is also ideally suited for research oriented systems, since pruning is independent of the parametrization used (eliminates the necessity for retuning thresholds). Additional features of this method, which are of importance to maintaining the flexibility and diagnosticity needed for such a system, will be discussed. Author (GRA)

N82-12819# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

SCHEMES FOR COMMUNICATION

Mathai Joseph 3 Jun. 1981 44 p refs

(Contract F33615-78-C-1551; ARPA Order 3597)

(AD-A104791; CMU-CS-81-122) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes features of a language for distributed and parallel programming which has been designed to provide flexibility in the transfer of information and control between the individual components of a program. The language allows synchronous and asynchronous message-passing, multiple-source input and broadcast output, and enables particular features of a distributed architecture to be efficiently accommodated without modification to the language. The module serves as the unit of encapsulation and a single communication takes place between an output port in one module and a set of input ports in other modules: each port has a control rule which specifies the protocol for sending or receiving messages, and is associated with a particular communication scheme which implements the communication operations. Modules are assumed to execute independently of each other except when they communicate by sending messages: the lifetime of a module is therefore limited only by its ability to send and receive messages. The use of the distinctive features of the language, such as broadcast mode output, is illustrated with several examples. Author (GRA)

N82-12820# Maryland Univ., College Park. Computer Vision Lab.

PARALLEL STRING PARSING USING LATTICE GRAPHS

Azriel Rosenfeld May 1981 18 p refs

(Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A105028; TR-1036; AFOSR-81-0623TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Given a grammar G and a string sigma, all possible parses of sigma can be constructed by repeatedly applying the rules of G in parallel. This process creates a 'lattice graph' in which any directed path from the least element to the greatest element is a sentential form that occurs in a (partial) parse of sigma. Examples are given illustrating how, at least for some grammars, this process does not lead to a combinatorial explosion, and could thus be used to parse strings very rapidly if suitable parallel hardware were available. Author (GRA)

N82-12821# Maryland Univ., College Park. Dept. of Computer Science.

AN OPERATIONAL APPROACH TO REQUIREMENTS SPECIFICATION FOR EMBEDDED SYSTEMS

Pamela Zave Aug. 1981 71 p refs

(Contract F49620-80-C-0001; AF Proj. 2304)

(AD-A105459; AFOSR-81-0662TR) Avail: NTIS HC A04/MF A01 CSCL 09/2

The approach to requirements specification for embedded,

systems described in this paper called 'operational' because a requirements specification is an executable model of the proposed system interacting with its environment. The approach is embodied by the language PAISLey, which is motivated and defined herein. Embedded systems are characterized by asynchronous parallelism, even at the requirements level; PAISLey specifications are constructed of interacting processes so that this can be represented directly. Embedded systems are also characterized by urgent performance requirements, and PAISLey offers a formal, but intuitive, treatment of performance. Author (GRA)

N82-12822# Maryland Univ., College Park. Dept. of Computer Science.
ERROR PROPAGATION AND ELIMINATION IN COMPUTER PROGRAMS
Larry J. Morell and Richard G. Hamlet Jul. 1981 50 p refs
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A105437; TR-1065; AFOSR-81-0661TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The current literature in program testing is surveyed. A strategy is proposed for eliminating categories of errors from programs. Errors may be classified as functional (an incorrect input-output pair) or structural (an incorrect statement). An error is eliminated if a successful program execution for a given input implies the program could not contain the error. A 'creation condition' guarantees that a structural error affects the program's computation. A 'propagation condition' guarantees that the effect produces a functional error. An error is eliminated whenever a computation satisfies both the creation and the propagation condition and produces correct output. Author (GRA)

N82-12823# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PRACTICAL ASPECTS OF NONLINEAR OPTIMIZATION
Richard B. Holmes and Jeffrey W. Tolleson 19 Jun. 1981 56 p refs
(Contract F19628-80-C-0002)
(AD-A104858; TR-576; ESD-TR-81-155) Avail: NTIS HC A04/MF A01 CSCL 12/1

A general purpose nonlinear programming method and computer code are presented. The method is basically heuristic but extremely simple and reliable. Interactive operation of the code and its performance on several test problems is described. Author (GRA)

N82-12824# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A PREVIEW OF ACT 1
Henry Lieberman May 1981 25 p refs
(Contracts N00014-75-C-0522; N00014-80-C-0505)
(AD-A104964; AI-M-625) Avail: NTIS HC A02/MF A01 CSCL 06/4

The next generation of artificial intelligence programs will require the ability to organize knowledge as groups of active objects. Each object should have only its own local expertise, the ability to operate in parallel with other objects, and the ability to communicate with other objects. Artificial Intelligence programs will also require a great deal of flexibility, including the ability to support multiple representations of objects, and to incrementally and transparently replace objects with new, upward-compatible versions. To realize this, we proposed a model of computation based on the notion of an actor, an active object that communicates by message passing. Actors blur the conventional distinction between data and procedures. The actor philosophy is illustrated by description of our prototype actor interpreter Act 1. Author (GRA)

N82-12825# Polytechnic Inst. of New York, Brooklyn.
SOFTWARE MODELING STUDIES. VOLUME 4: A STATISTICAL THEORY OF COMPUTER PROGRAM TESTING Final Technical Report, Jan. 1978 - Oct. 1980
Arthur E. Laemmel Jul. 1981 32 p refs
(Contract F30602-78-C-0057; AF Proj. 2304)
(AD-A105078; POLY-EE-80-004-Vol-4; RADC-TR-81-183-Vol-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

Program testing is studied for maximizing the reliability of computer programs. Several formulas are derived to estimate the number of tests required to say that a program being tested is correct with a given probability. Strategies to select those test cases which minimize the probability of program error while keeping the number of tests fixed, are investigated. (Author) GRA

N82-12826# Polytechnic Inst. of New York, Brooklyn.
SOFTWARE MODELING STUDIES. VOLUME 2: THE POLYNOMIAL MEASURE OF COMPLEXITY Final Technical Report, Jan. 1978 - Oct. 1980
Henry Ruston Jul. 1981 60 p refs
(Contract F30602-78-C-0057; AF Proj. 2304)
(AD-A105004; RADC-TR-81-183-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

A new measure of software complexity is introduced, one which describes a flow chart by a polynomial. This measure takes both the elements of a flow chart and its structure into account. Rules are given for obtaining the polynomials for various types of flow charts. The polynomial complexity measure can be used to compare alternate software designs and to divide a computer program into modules to obtain a minimal overall complexity. A comparison is made of this measure with several known complexity measures. Author (GRA)

N82-12827# California Univ., Livermore. Lawrence Livermore Lab.
SCALD 2 LOGIC SIMULATOR
J. B. Rubin 17 Sep. 1981 17 p refs
(Contract W-7405-eng-48)
(DE81-030879; UCID-19191) Avail: NTIS HC A02/MF A01

The SCALD 2 design system, a set of computer-aided logic design programs written in PASCAL which facilitates the design and implementation of synchronous digital systems is discussed. It is divided into two major sub-categories: the logical and physical design subsystems. The logical design subsystem consists of the macro expander, timing verifier, and logic simulator programs, wereas the physical design subsystem consists of the layout program and the packager. The logic simulator is discussed in particular. DOE

N82-12828# Centre Technique des Industries Mecaniques, Senlis (France).
TECHNOLOGY OF TOMORROW: COMPUTER ASSISTED DESIGN AND FABRICATION Final Report [VEILLE TECHNIQUE CFAO]
M. Chaussier 28 Nov. 1980 45 p refs In FRENCH
(CETIM-1.4A.32.3) Avail: NTIS HC A03/MF A01

The potentials of computer assisted design and fabrication (CADF) are analyzed for mechanical applications in industry. Adaptation of CADF systems to the specific needs of industrial companies is seen as problematical. The linking of many systems through ever more sophisticated data bases is suggested in order to improve CADF efficiency. The impact of interactive man machine techniques and of automated decision making are taken into account. Interactive graphics, a successful application of CADF, is cited for its contribution to mechanical engineering. Increased development and diffusion of CADF technology is forecast. Author (ESA)

N82-12829# Saab-Scania, Goteberg (Sweden). Aerospace Div.
DATA RATE REDUCTION, PHASE 2 Final Report
Paris ESA 1 Dec. 1980 72 p
(Contracts ESTEC-3749/78/NL-HP; ESTEC-4179/79/NL-HP)
(TNOT/0001/SAAB-Issue-3; TNOT/0007/SAAB-Issue-1; RA-SAT-5-275-Issue-2; ESA-CR(P)-1445) Avail: NTIS HC A04/MF A01

The results of the acceptance test of the breadboard model of a multispectral image data processor (IDP) are presented. A timing analysis of critical parts is included. Data were successfully compressed into 16 and then 32 classes. The hardware design of a processor for data rate reduction of image data for remote sensing satellites is given. The data reduction unit processes a whole multispectral image line. It is composed of several elementary processors (compressor modules) working in parallel. Each compressor module is a multispectral IDP, processing a 512 (maximum) pixel multispectral line segment. A breadboard model was used to verify functioning of the design of the

processor with respect to those parts of the circuits carrying out specific steps of the selected algorithm. Author (ESA)

N82-12830# Scicon Consultancy International Ltd., London (England).
SYSTEM SOFTWARE FOR THE ESTEC MULTIPROCESSOR RECONFIGURABLE SIMULATOR Final Report
Paris ESA Feb. 1981 35 p refs
(ESA-CR(P)-1456) Avail: NTIS HC A03/MF A01

The MPRS is a multiprocessor computer system designed for real time simulation applications. The DEMOS software technology transferred from the DEMOS 86 multicomputer project solves the problem of programming several processors connected together, allowing the multiprocessor to be treated as one machine. Facilities for the development of simulation applications programs are explained along with an operating system for real time simulation programs. Author (ESA)

N82-12831# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
THE GKS REVIEWING PROCESS
P. J. W. tenHagen Apr. 1981 22 p refs Submitted for publication
(MC-IW-164/81) Avail: NTIS HC A02/MF A01

The technical debate within the International Standards Organization on GKS is described, emphasizing the organization of the working group. Criteria for international acceptance of the GKS standard are studied. Results of the graphics standardization effort are related, mainly concerning reduction of the cost of accumulating hardware and software. Converting software to get an application running is also discussed. Author (ESA)

N82-12832# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ALGOL 68 PLUS: A SUPERLANGUAGE OF ALGOL 68 FOR PROCESSING THE STANDARD-PRELUDE
L. G. L. T. Meertens and J. C. vanVliet Jun. 1981 18 p refs
(MC-IW-168/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A sequence of declarations in a super language of ALGOL 68, ALGOL 68 plus, is given. These declarations together constitute the standard-prelude. In order to have an ALGOL 68 compiler process a version of the standard-prelude, it is necessary to define ALGOL 68 plus in which that version is written. The compiler must be able to accept programs (modules) written in ALGOL 68 plus. The necessary super language is defined, but only insofar as changes are needed to accomodate the standard-prelude itself (including the transput). Author (ESA)

N82-12833# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
CORRECTNESS OF PROGRAMS WITH FUNCTION PROCEDURES
J. W. deBakker, J. W. Klop, and J.-J.C. Meyer (Free Univ., Amsterdam) Jul. 1981 21 p refs Submitted for publication
(MC-IW-170/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum FL 3,15

The correctness of programs with programmer-declared functions is investigated. The framework of typed lambda calculus with explicit declaration of (possibly recursive) functions is used. Its expressions occur in the statements of a simple language with assignment, composition and conditionals. A denotational and an operational semantics for this language are provided, and their equivalence is proven. A proof system for partial correctness is presented and its soundness is shown. Completeness is then established for the case that only call by value is allowed. Allowing call by name as well, completeness is shown only for the case that the type structure is restricted, and at the cost of extending the language of the proof system. The completeness problem for the general case remains open. In the technical considerations, an important role is played by a reduction system which essentially makes it possible to reduce expression evaluation to systematic execution of auxiliary assignments. Termination of this reduction system is shown using Tait's computability technique. Author (ESA)

62 COMPUTER SYSTEMS

Includes computer networks.

N82-12834 California Univ., Los Angeles.
THE ANALYSIS AND SYNTHESIS OF INTERCONNECTION NETWORKS FOR DISTRIBUTED COMPUTER SYSTEMS Ph.D. Thesis
Han-Ping Daniel Chen 1981 270 p
Avail: Univ. Microfilms Order No. 8120931

An interconnection network is synthesized from a set of user-specified requirements. Four well-defined synthesis procedures are proposed; the element deletion synthesis procedure, the matrix-reductio synthesis procedure, the stagewise-formulation synthesis procedure, and the tree-merging synthesis procedure. The user requirements are divided into two major categories: functional constraints and design constraints. A generalized failure model the 2 x 2 basic switching element is presented. A generalized reliability model is defined to handle all known failure modes and any given component dependency. A graphical evaluation structure and some graphical AND-OR operations are introduced to evaluate configuration reliability, connection reliability, functional reliability, and network reliability. Two kinds of network descriptions are used: first, the physical structure containing elements and wiring patterns; second, the logical model containing a set of logical entities using the graphical model as a starting point. Dissert. Abstr.

N82-12835# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Computer Sciences.
MULTICAST AND SYNCHRONIZATION IN DISTRIBUTED SYSTEMS
Jan Skansholm 1981 51 p refs
(Contract SWEDBTD-71.348-U-253)
(CTH-81.2-R) Avail: NTIS HC A04/MF A01

The construction of distributed algorithms and synchronization tools in distributed systems becomes simple if a multicast addressing principle is used. However, the transport mechanism must satisfy the requirements that all messages are delivered to all processes, and that all messages are delivered in the same order to all processes. These requirements are found to be realistic and some network types are especially well suited for this kind of addressing. An algorithm is presented which can make any network able to guarantee that messages are delivered in the same order to the processes in a system. Author (ESA)

N82-12836# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
FAULT TESTING AND DIAGNOSIS IMPLEMENTATION IN MICROPROCESSOR CONTROLLED DATA NETWORKS
Wafae Boghdady Mar. 1981 227 p refs
(ESNT-D-81001) Avail: NTIS HC A11/MF A01

Fault testing technique is reviewed and on-line self test procedures for microprocessor systems are proposed. Random access memory (RAM) test procedures with half the test time requirement of the known RAM minimum test pattern, MASEST, and increased applicability are considered. Global self test procedures for microprocessor units, derived from a combination of structural, functional and behavioral approaches, specified by introducing algorithmic patterns, and composed of sequential dedicated programs, each of which has its own meaningful test objective are discussed. Oriented test procedures based on the combination of the philosophy of real time tests and the partitioning of the applications programs by controllability observability and maintenance engineering technique (COMET) are presented. Author (ESA)

N82-12837# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
COMMUNICATING GRAPHICS
P. J. W. tenHagen Apr. 1981 14 p refs Submitted for publication
(MC-IW-166/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

Communication of computer graphics information via public data networks is analyzed. Communication levels are derived from functional levels in existing graphics systems for viewing.

The relationship between communication of graphical data and standards for graphics programming are outlined. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N82-12838 Maryland Univ., College Park.
THE QUEUEING DELAY PROBLEM IN MULTIPLE ACCESS SCHEMES Ph.D. Thesis
Terek Nazir Saadawi 1980 164 p
Avail: Univ. Microfilms Order No. 8121100

Multiple access schemes with a finite number of buffered uses were analyzed. The approach is suitable for a variety of accessing schemes including random access schemes and reservation based demand access. The approach models the interaction between the competing terminals by a combination of two Markov chains; describes the buffer concepts of the typical user, and describes the state of all the users in the system. The dependence between equilibrium distributions of the states of the user Markov chain and those of the system Markov chain produces sets of coupled equations for these probabilities which are solved numerically. It is assumed that all messages consist of single packets, which are generated in a bursty manner, the arrival process at each terminal is assumed to be Bernoulli.
Dissert. Abstr.

N82-12839*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
A SURVEY OF SOME PROBLEMS AND RECENT RESULTS FOR PARAMETER ESTIMATION AND OPTIMAL CONTROL IN DELAY AND DISTRIBUTED PARAMETER SYSTEMS
H. T. Banks Jul. 1981 33 p refs Presented at the Conf. on Volterra and Functional Differential Equations, Blacksburg, Va., 10-13 Jun. 1981
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants AF-AFOSR-3092-76; NSF MCS-79-05774-02; AF Proj. 2304)
(NASA-CR-16491; AD-A105415; LCDS-81-19; AFOSR-81-0670TR) Avail: NTIS HC A03/MF A01 CSCL 12A

The investigator surveyed a number of applications and problems motivating his current efforts on numerical techniques for parameter estimation in and optimal control of delay and partial differential equations. He then outlined two different approaches for establishing theoretical convergence results for estimation algorithms. An application of modal techniques to the investigation of transport in brain tissue is briefly explained. A sketch of a convergence theory for spline techniques for function space parameter estimation problems is given. GRA

N82-12840# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
KNOWLEDGE-BASED EXPERT SYSTEMS: A BRIEF BIBLIOGRAPHY
Michael D. Rychener 26 Jun. 1981 9 p
(Contract F33615-78-C-1551; ARPA Order 3597)
(AD-A104793; CMU-CS-81-127) Avail: NTIS HC A02/MF A01 CSCL 09/2

A number of Artificial Intelligence (AI) systems have appeared in recent years whose approaches appear very fruitful for a wide variety of real-world tasks that are performed by knowledgeable (but not necessarily understanding) experts. In the interest of acquainting a wider audience to a representative sampling of these systems, and especially to the approaches they embody, the following selective reading list is proposed. These readings are not overly technical, and usually make their main points by way of examples of natural language dialog between a user and the expert AI system. Papers usually contain further references to related work and background material. The intended audience includes engineers (especially designers), social scientists, computer specialists without AI background, and other professionals. In the following, I have grouped papers roughly into categories, some of which contain specific systems while others are broader overviews or even general introductions to the wider field of AI. In the interest of being representative, a number of systems of approximately equal significance to those given hear have been omitted. The papers here do in fact refer to these others. GRA

N82-12841# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SEMANTICS OF INHERITANCE AND ATTRIBUTIONS IN THE DESCRIPTION SYSTEM OMEGA
Giuseppe Attardi and Maria Simi Aug. 1981 43 p refs
(Contracts N00014-80-C-0505; N00014-75-C-0522)
(AD-A104776; AI-M-642) Avail: NTIS HC A04/MF A01 CSCL 05/7

Omega is a description system for knowledge embedding which incorporates some of the attractive modes of expression in natural language such as descriptions, inheritance, quantification, negation, attributions and multiple viewpoints. Omega represent an investigation both on logic formalisms more expressive then first order predicate logic and on the foundations of knowledge representation. The logic of Omega combines mechanisms of the predicate calculus, type systems, and set theory. As a logic, Omega achieves the goal of an intuitively sound and consistent theory of classes which permits unrestricted abstraction within a powerful logic system. Description abstraction is the contruct provided in Omega corresponding to set abstration. Attributions and inheritance are the basic mechanisms for knowledge structuring. To achieve flexibility and incrementality, the language allows to express descriptions with an arbitrary number of attributions, rather then predicates with a fixed number of arguments as in predicate logic. This requires an unusual interpretation for instance descriptions, which in turn provides insights into the use and meaning of several kind of attributions. The logic foundations for Omega are investigated. Semantic models are provided, an axiomatization is derived and the consistency and completeness of the logic is established.
Author (GRA)

N82-12842# Brookhaven National Lab., Upton, N. Y.
PROJECT IMPACT ANALYSIS AS AN OPTIMAL CONTROL PROBLEM
G. Anandalingam 1981 43 p refs Presented at the Joint Meeting of the Inst. of Management Sci. and Operations Res. Soc., Toronto, 3-6 May 1981
(Contract DE-AC02-76CH-00016)
(DE81-028465; BNL-29881; CONF-810542-5) Avail: NTIS HC A03/MF A01

The effects of a major investment project on a multi-sector less developed economy are analyzed. Single investment projects with external effects reaching across the entire economy are frequently encountered in developing countries. The Mahaweli Ganga development project in Sri Lanka, a multi-dam irrigation and hydroelectric power project is evaluated. The Mahawell project calls for an annual investment level, in 1970 prices, of $150 million over a period of six years, which is 50 percent of the annual expenditure of the government. The project requires a large fraction of total investment over a medium term planning period and materially alters the existing supply and demand for major goods and services. The project is sufficiently large that its effect is economy-wide. The model used is a dynamic input-output optimizing model having the mathematical structure of an optimal control problem. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-12843 Iowa State Univ. of Science and Technology, Ames.
THE NUMERICAL SOLUTION OF FREDHOLM INTEGRAL EQUATIONS OF THE FIRST KIND Ph.D. Thesis
Kevin Ray Hickey 1981 135 p
Avail: Univ. Microfilms Order No. 8122522

A convergence theorem for Lee and Prenter's filtered least squares method for solving the Fredholm first kind equation Kf = g is corrected. Under suitable restrictions, the filtered least squares method is shown to be well-posed under compact

perturbations in K and arbitrary perturbations in g. Several convergence results are proved for the M-solution. A modified Gram-Schmidt method for calculating the M-solution of Kf = g is compared to a modification of the normal equations method which is used to calculate the M-solution of Kf = g. This modified Gram-Schmidt method is shown to be well-posed under compact perturbations in K and arbitrary perturbations in g. A convergence theorem for Marti's method for solving the Fredholm first kind equation Kf = g is corrected. Marti's method is shown to be well-posed under perturbations in g. It is shown that Marti's method is not necessarily well-posed under compact perturbations in K. Dissert. Abstr.

N82-12844# Texas Univ., Austin.
NATURAL EXPONENTIAL FAMILIES WITH QUADRATIC VARIANCE FUNCTIONS
Carl N. Morris Jul. 1981 41 p Prepared jointly with Rand Corp., Santa Monica, Calif.
(Grant NSF MCS-80-03416)
(P-6637) Avail: NTIS HC A03/MF A01

The normal, Poisson, gamma, binomial, and negative binonial distributions are characterized as natural exponential families with quadratic variance functions. A sixth family is identified as being generated by the hyperbolic secant distribution. These families are examined in a unified way with respect to infinite divisibility, cumulants, orthogonal polynomials, large deviations, and limits in distribution. Insights are obtained concerning the possible limit laws and the self-regulating nature of infinite divisibility. R.J.F.

N82-12845*# College of William and Mary, Williamsburg, Va.
DEEP ANISTROPIC SHELL PROGRAM FOR TIRE ANALYSIS Final Report
Carl M. Andersen Washington NASA Nov. 1981 33 p refs
(Contract NAS1-15965)
(NASA-CR-3483) Avail: NTIS HC A03/MF A01 CSCL 12A

A finite element program was constructed to model the mechanical response of a tire, treated as a deep anisotropic shell, to specified static loads. The program is based on a Sanders Budiansky type shell theory with the effects of transverse shear deformation and bending-extensional coupling included. A displacement formulation is used together with a total Lagrangian description of the deformation. Sixteen-node quadrilateral elements with bicubic shape functions are employed. The Noor basis reduction technique and various type of symmetry considertions serve to improve the computational efficiency.M.G.

N82-12846# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
A REGRESSION DESIGN APPROACH TO OPTIMAL AND ROBUST SPACING SELECTION
Randall L. Eubank Jul. 1981 20 p refs
(Contract N00014-75-C-0439)
(AD-A104728; TR-144) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of location and/or scale parameter estimation using the asymptotically best linear unbiased estimator based on sample quantiles is considered. The problem of optimal spacing selection for these estimators is shown to be equivalent to the problem of regression design for time series with Brownian motion or Brownian bridge covariance structures and a particular variable knot spline approximation problem. This equivalence is employed, in conjunction with a regression framework, to investigate the asymptotic properties of certain spacing selection schemes. In particular, an asymptotic alternative is developed to a robust estimation procedure suggested by Chan and Rhodin (1980). Author (GRA)

N82-12847# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
BIVARIATE CUMULANTS OF A SINGLY TRUNCATED BIVARIATE NORMAL DISTRIBUTION
Youn-Min Chou (Texas Univ. at San Antonio) and D. B. Owen Aug. 1981 9 p refs
(Contract N00014-76-C-0613)
(AD-A104914; TR-147) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method of obtaining the bivariate cumulants of any order is given for a truncated bivariate normal distribution where one of the variates is truncated at w sub o. Some representative values are displayed in tables. Author (GRA)

N82-12848# Texas A&M Univ., College Station. Inst. of Statistics.
MINIMUM MEAN SQUARE ERROR PREDICTION OF AUTOREGRESSIVE MOVING AVERAGE TIME SERIES
H. Joseph Newton and Marcello Pagano (State Univ. of New York at Buffalo) Apr. 1981 29 p refs
(Contracts DAAG29-80-C-0070; N00014-81-MP-10001)
(AD-A104939; TR-N-24) Avail: NTIS HC A03/MF A01 CSCL 12/1

A computer program is described and presented for calculating finite memory predictors and prediction variances for autoregressive moving average time series models. The Cholesky decomposition algorithm is used, and a number of simplifying results are described and implemented in the program. Author (GRA)

N82-12849# Texas A&M Univ., College Station. Inst. of Statistics.
AUTOREGRESSIVE SPECTRAL ESTIMATION, LOG SPECTRAL SMOOTHING AND ENTROPY
Emanuel Parzen Jul. 1981 9 p refs
(Contract DAAG29-80-C-0070)
(AD-A104940; TR-N-26) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two important methods of spectral estimation, autoregressive spectral estimation, and log spectral kernel estimation are derived from a minimum information divergence estimation principle. The fact that autoregressive spectral estimators are maximum entropy estimators is shown to be proved without the use of the calculus of variations using the properties of minimum info.mation divergence estimation. Adaptive procedures for forming these estimators (and combining to form iterated estimators) are provided by order-determining and truncation point determining criteria, which are described. An estimated spectrum is given for Wolfer's sunspot data. Author (GRA)

N82-12850# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A MODEL FOR UNCOORDINATED DISTRIBUTED COMPUTATION OF FIXED POINTS
Dimitri P. Bertsekas Sep. 1981 7 p refs
(Contract N00014-75-C-1183)
(AD-A104819; LIDS-P-1144) Avail: NTIS HC A02/MF A01 CSCL 09/2

We present an algorithmc model for distributed computation of fixed points whereby several processors participate simultaneously in the calculations while exchanging information via communication links. We place essentially no assumption on the ordering of computation and comm unication between processors thereby allowing for completely uncoordinated execution. We find that even under these potentially chaotic circumstances it is possible to solve several important classes of problems including the calculation of fixed points of contraction and monotone mappings arising in linear and nonlinear systems of equations, shortest path problems, and dynamic programming. Author (GRA)

N82-12851# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
NUMERICAL METHODS FOR SINGULARLY PERTURBED DIFFERENTIAL EQUATIONS WITH APPLICATIONS Interim Report, 1 Jun. 1980 - 31 May 1981
Joseph E. Flaherty May 1981 18 p refs
(Grant AF-AFOSR-0192-80; AF Proj. 2304)
(AD-A105366; AFOSR-81-0626TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period covered by this report, the investigator continued his research on the development and application of numerical methods for singularly-perturbed (or stiff) boundary value problems for ordinary differential equations. Results were obtained for collocation and finite difference methods for scalar and vector systems of two-point boundary value problems and for adaptive grid finite element methods for partial differential equations. His exponentially weighted finite element and spline in tension methods are being applied to partial differential

equations as well as to ordinary differential equations.
Author (GRA)

N82-12852# RAND Corp., Santa Monica, Calif.
SOLUTION METHODS ON ALGEBRA PROBLEMS WITH SIMULTANEOUS EQUATIONS
Jane Sachar Jan. 1981 24 p refs
(AD-A105178; RAND/P-6593) Avail: NTIS HC A02/MF A01 CSCL 12/1

Problem solving approaches often find a path from the givens to the unknown or from the unknown to the givens. This study explores those approaches using written protocols of Navy subjects while solving for the numerical value of an unknown from several knowns and a system of equations. For a subset of the items, solutions require subjects to retain expressions with both literals and numerals. Successful and unsuccessful students were similar in their preference to work backward and to use literals rather than numerals and in the efficacy of their solutions. Students acquired successful solution methods during instruction and used them consistently. Author (GRA)

N82-12853# SRI International Corp., Menlo Park, Calif.
TWO-DIMENSIONAL MESH AJUSTMENT ALGORITHM Annual Technical Report, 1 Jun. 1980 - 31 May 1981
C. M. Ablow and S. Schechter 17 Jul. 1981 6 p refs
(Contract F49620-77-C-0114; AF Proj. 2304)
(AD-A105439; AFOSR-81-0622TR; SRI-6469) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the fourth year of research, the gradient and truncation error minimizing mesh adjustment algorithms have been applied to a reactive flow problem in one dimension and to basic illustrative examples in two dimensions. The methods increase the accuracy of a numerical solution with a fixed number of nodes. The storage needed for lower dimensional calculations is reduced, which makes higher dimensional ones feasible. Author (GRA)

N82-12854# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
AN ERROR ESTIMATE FOR THE H EXP (-1) GALERKIN METHOD FOR A PARABOLIC WITH NON-SMOOTH INITIAL DATA
Huang Mingyou and Vidar Thomee 1981 14 p refs
(CTH-Math-1981-11) Avail: NTIS HC A02/MF A01

A non-smooth data error estimate with respect to the L sub 2 norm for the continuous in time semidiscrete H (-1) Galerkin method is presented for an initial boundary value problem in a single space variable. If the trial and test spaces consist of piecewise polynomials of degree r-1 in C(k) and r+1 in C(k+2) respectively, with test functions satisfying boundary conditions, then the error norm is bounded by Ch(r)t(-r/2) for t positive, where h is the maximum mesh size. Author (ESA)

N82-12855# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
THE AUTOMATIC SOLUTION OF FREDHOLM EQUATIONS OF THE SECOND KIND
H. Schippers Dec. 1980 31 p refs Submitted for publication
(MC-NW-99/80) Avail: NTIS HC A03/MF A01; Stichting Mathemathisch Centrum, Amsterdam FL 4,20

A code for the automatic solution of Fredholm equations of the second kind, solve-int-eq, is presented. The linear system resulting from the discretization of the integral equation is iteratively solved by a multiple grid method. This method was selected because it has been shown that multiple grid processes take only O (N sup 2) arithmetic operations. For a variety of problems, the performance of solve-int-eq is compared with Aktinson's program iesimp. This program appears to be about 50% more expensive than solve-int-eq. Additionally, solve-int-eq was applied to the aerodynamic problem of calculation of potential flow around a Karman-Trefftz airfoil. Numerical examples were computed on a CDC Cyber 175 computer in single precision arithmetic. Results demonstrate the appropriateness of solve-int-eq to this class of aerodynamic problem. Author (ESA)

N82-12856# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
INSTRUCTIVE EXPERIMENTS WITH RUNGE-KUTTA-ROSENBRUCK METHODS
J. G. Verwer Mar. 1981 25 p refs Submitted for publication
(MC-NW-100/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

Certain boundedness properties of Runge-Kutta-Rosenbrock methods when applied to nonlinear stiff systems are dealt with. Instructive examples and numerical experiments are performed with a number of simple two stage schemes and the Rosenbrock code ROW4A. Attention is paid to the conversion of nonautonomous problems to the autonomous form. An important conclusion is that this conversion may lead to a significant loss in accuracy. Author (ESA)

N82-12857# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ON THE PRACTICAL VALUE OF THE NOTION OF BN-STABILITY
J. G. Verwer Mar. 1981 12 p refs Submitted for publication
(MC-NW-101/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A standard implementation of diagonally implicit Runge-Kutta methods, having equal diagonal elements, is discussed. Under what circumstances unconditional nonlinear stability can be realized in practice is questioned. The oldest concept of unconditional stability of numerical integration methods for ordinary differential systems is that of A-stability. This concept is related to linear systems having constant coefficients. There has been much interest in unconditional stability properties of numerical integration methods when applied to nonlinear dissipative systems (G-stability, BN-stability, A-contractivity). Various classes of implicit Runge-Kutta methods have already been shown to be BN-stable. However, contrary to the property of A-stability, when implementing such a method for practical use this unconditional stability property may be lost. This is clarified for the class of diagonally implicit methods and it is shown at the same time that Rosenbrock's method is not BN-stable. Author (ESA)

N82-12858# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
APPLICATION OF THE OSHER-ENGQUIST DIFFERENCE SCHEME AND THE FULL MULTIGRID METHOD TO A TWO DIMENSIONAL NONLINEAR ELLIPTIC MODEL EQUATION
E. J. vanAsselt Apr. 1981 19 p refs Submitted for publication
(MC-NW-103/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A nonlinear boundary value problem in two dimensions is considered. For the discretization of this boundary value problem, the Osher-Engquist difference scheme is used and the discrete equations are solved by a full multigrid method (FMGM). In the FMGM, a coarse to fine sequence of grids with uniform meshes is applied. The result obtained on a coarser grid serves as initial approximation to the solution on the finer grid. On each grid the discrete equations are solved by Newton iteration. The Newton equations are approximately solved by the iterative use of a linear multilevel algorithm. Numerical results are given and comparisons with the method of time steps show that the multigrid approach is far more efficient than the method with explicit time steps. Author (ESA)

N82-12859# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
ANALYSIS OF RICHARDSON ITERATION IN MULTIGRID METHODS FOR NONLINEAR PARABOLIC DIFFERENTIAL EQUATIONS
P. J. vanderHouwen and B. P. Sommeijer Apr. 1981 41 p refs Submitted for publication
(MC-NW-105/81) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 5,25

The behavior of nonlinear Richardson iteration in multigrid methods for solving the implicit relations obtained when an implicit one step method is applied to the space discretized form of a nonlinear parabolic differential equation is analyzed. This analysis leads to an unconventional form of the Richardson method which turns out to be a remarkably efficient predictor formula to start

the multigrid method. Numerical experiments are run with a two grid algorithm and a comparison is made with nonlinear Gauss-Seidel iteration. For large integration steps and for strongly nonlinear problems the Richardson iteration method appears to be superior to Gauss-Seidel iteration. Author (ESA)

N82-12860# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A SPECIAL CLASS OF MULTISTEP RUNGE-KUTTA METHODS WITH EXTENDED REAL STABILITY INTERVAL
P. J. vanderHouwen and B. P. Sommeijer May 1981 33 p refs Submitted for publication
(MC-NW-106/81) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

A special class of k-step Runge-Kutta methods is investigated which is generated by nonlinear Chebyshev iteration (Richardson iteration) of an implicit linear multistep method. By terminating the iteration process after m iterations, a family of the k-step, m-stage Runge-Kutta method is obtained whose real stability interval can be derived for general values of k and m by a special application of the boundary locus method. The real stability boundary is maximized by choosing suitable values for the coefficients in the generating k-step method. The considerations are mainly restricted to second order methods. Examples are given for k = 1,2,3, and 4, and numerical experiments are reported with a nonlinear parabolic initial boundary value problem. Author (ESA)

N82-12861# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
MODIFIED MULTILAG METHODS FOR VOLTERRA FUNCTIONAL EQUATIONS
P. H. M. Workenfelt Jun. 1981 33 p refs Submitted for publication
(MC-NW-108/01) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

Linear multistep methods for ordinary differential equations in conjunction with a family of computationally efficient quadrature rules are employed to define a class of multilag methods for the solution of Volterra integral and integrodifferential equations. In addition, modified multilag methods are proposed which have the property that the stability behavior is independent of the choice of the quadrature rules. High-order convergence of the methods is established. In particular, a special class of high-order convergent methods is presented for the efficient solution of first kind Volterra equations. Numerical experiments are reported. Author (ESA)

N82-12862# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
TWO THEOREMS ABOUT THE COMPLETENESS OF HOARE'S LOGIC
J. A. Bergstra (Leiden Univ.) and J. V. Tucker (Bristol Univ. England) Apr. 1981 16 p refs Submitted for publication
(MC-IW-165/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

Two theorems about the completeness of Hoare's logic for the partial correctness of 'while' programs over an axiomatic specification are proven. The first result is a completion theorem: any specification (Sigma, E) can be refined to a specification (Sigma sub zero, E sub zero), conservative over (Sigma, E), whose Hoare's logic is complete. The second result is a normal form theorem: any complete specification (Sigma, E) possessing some complete logic for partial correctness can be refined to an effective specification (Sigma sub zero, E sub zero), conservative over (Sigma, E), which generates all true partial correctness formulas with Hoare's standard rules. Author (ESA)

N82-12863# Physics Lab. RVO-TNO, The Hague (Netherlands).
SIMULATION OF THE THERMAL BEHAVIOR OF AN OBJECT AND ITS NEARBY SURROUNDINGS
P. A. M. Jacobs Feb. 1980 96 p refs
(Contract A72/KL/026)
(PHL-1980-08; IDCK-73838) Avail: NTIS HC A05/MF A01

A physical-mathematical model which describes thermal behavior of an object in a natural environment is presented. An airtight rectangular box was fixed to a base which prevents evaporation, (brick, concrete, etc). Dimensions are arbitrary. The model is used to decide specifications for camouflage materials and/or to predict thermal contrasts. It calculates the daily course of temperature, sunshine etc. and the total irradiance incident on a detector at a given bearing. For given meteorological data the model solves the time dependant heat balance equation valid for the box surface and base. Effects of shadow, wind sheltering, etc., are taken into account. An explicit finite difference method is used for the algorithm. When checked against measurement (wind, solar irradiance, etc.) the model performs well. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-12864 Louisville Univ., Ky.
A STATISTICAL APPROACH TO FUZZY DATA ANALYSIS Ph.D. Thesis
Larry Wayne Lewis 1981 169 p
Avail: Univ. Microfilms Order No. 8121457

An extension of classical nonparametric hypothesis testing is given for the analysis of fuzzy-number data. An atypical format which permits a theoretical population containing fuzzified forms of data which reside in a classical population is discussed. A fuzzified parametric hypothesis testing format is given. This format lends itself to the direct analysis of fuzzy data sets of known distributional form. Both the nonparametric and the parametric procedures outlined for fuzzy data analyses reduce to their classical antecedents when the fuzzy numbers are sharp--i.e., real numbers. Dissert. Abstr.

N82-12865 California Univ., Los Angeles.
LOG ODDS RATIO ESTIMATION IN A GROUPED POPULATION Ph.D. Thesis
Richard Sposto 1981 237 p
Avail: Univ. Microfilms Order No. 8122850

A population consisting of a subpopulation of diseased individuals and one of nondiseased individuals, and made up of K-groups, such that the withingroup log odds ratio phi, of exposure to a factor is the same in all groups is considered. Methods to obtain point estimates and confidence intervals for phi in K-groups are examined. Some of the asymptotic properties of the point and interval estimators are derived and a sampling experiment is performed to assess and compare the small sample properties of these estimators. The study of properties of confidence intervals for the common log odds ratio is emphasized. It is indicated that the sampling experiment of the Mantel-Haenszei or unconditional maximum likelihood estimators of phi are at least as good as or preferable to the others. Dissert. Abstr.

N82-12866 California Univ., Los Angeles.
SPACE-TIME CLUSTERING ANALYSIS Ph.D. Thesis
Timothy Lane McAuliffe 1981 149 p
Avail: Univ. Microfilms Order No. 8120999

Methods for detecting space time clustering was surveyed. A method of testing for space time clustering which does not depend on arbitrary constants is proposed. Procedure is based on nearest neighbor distances. It is suggested that the powers of the Knox and the Mantel reciprocal transformation method are quite sensitive to the choice of their critical constants, with the Knox methods the more sensitive. The nearest neighbor approach has power usually as great as that of the Mantel procedure. The nearest neighbor approach is recommended for testing the presence of space time clustering based on its control of the true significance level, its power and its avoidance of choosing arbitrary constants. Dissert. Abstr.

N82-12867 California Univ., Los Angeles.
DISCRIMINATION RULES BASED ON MARGINAL DISTRIBUTIONS Ph.D. Thesis
Carl Edward Pierchala 1981 285 p
Avail: Univ. Microfilms Order No. 8121031

A new method of discriminant analysis used in a recent medical study was evaluated. The D-Rule method is based on the marginal distributions of the observations. For bivariate

Gaussian populations, results for the D-Rule were obtained and interpreted in geometric terms. The performance of Fisher's linear discrimination rule (LDR) in the case of the known univariate lognormal populations was examined. The effects of sample size and of missing values were studied. Sampling distributions of the cross-validation total probability of correct classification were compared by of box-and-whisker plots. The methods studied were the D-Rule; three variants thought to be improvements upon the D-Rule; and two versions of the LDR for missing data. The consequence of using the resubstitution total probability of correct classification to choose among the several rules is also studied.
Dissert. Abstr.

N82-12868 California Univ., Los Angeles.
OPTIMAL ADAPTIVE STOCHASTIC CONTROL OF LINEAR DYNAMICAL SYSTEMS WITH MULTIPLICATIVE AND ADDITIVE NOISE Ph.D. Thesis
Hagop Vartevar Panossian 1981 181 p
Avail: Univ. Microfilm Order No. 8121027

The adaptive stochastic control of linear multivariable discrete time systems with purely random parameters is investigated. No aposteriori learning is available for the system parameters and the control law is non-dual. In these cases of perfect measurement, the apriori level of uncertainty of the system parameters modulates the control law and the certainty equivalence principle does not apply. It is shown that for the linear-quadractic Gaussian (LQG) optimal control problem the steady-state solution exists only under certain conditions. The stability and optimality are treated and contrasted by studying the discounted cost version of the LOG problem. For the situation of noisy measurement, the problem of estimating the plant phase coordinate vector is considered. An algorithm is developed which is of lower dimension than the Kalman-Bucy filtering algorithm. The control law requires the solution of a coupled, highly nonlinear two point boundary value problem. Computer simulations of the forward and backward difference equations involved are presented for some insight for the closed-loop system. Dissert. Abstr.

N82-12869 Illinois Univ. at Chicago Circle, Chicago.
ERROR PROPAGATION IN THE GRAVITY MODEL Ph.D. Thesis
James Stuart Weber 1981 216 p
Avail: Univ. Microfilms Order No. 8120574

The need for modeling of flows, the frequent use of the gravity family of models, the necessity for a basic statistical perspective, and the calculus notation needed for the study of error propagation in a multidimensional setting are reviewed. Two procedures for computing the linear estimates of the error propagation for the doubly constrained gravity model are derived, and the appropriate procedure for the estimation of confidence intervals for minority employment given certain aggregate statistics, the estimation of confidence intervals for doubly constrained gravity model forecasts, and the more efficient updating of doubly constrained gravity model flows are applied. The error propagation statistics for the generalized gravity model separation factor parameters is studied. Error propagation is examined in the context of model output in terms of estimates of expected flows, of forecasts of flows, and of an efficient updating procedure as well as in the context of variable selection and fitting the model to observed data. Dissert. Abstr.

N82-12870 Texas A&M Univ., College Station.
A QUANTILE FUNCTION APPROACH TO THE k-SAMPLE QUANTILE REGRESSION PROBLEM Ph.D. Thesis
James Michael White 1981 122 p
Avail: Univ. Microfilms Order No. 8121975

A procedure for estimating the parameters of a quantile regression function is investigated. The procedure is based on the work of Parzen (1979a) in the theory of quantile functions and is applicable to a wide range of distributional families. The procedure assumes the quantile functions of k populations to be location-scale shifts of a common quantile function. First, a goodness-of-fit procedure for determining the common distributional shape of the k populations generalizes the one-population data modeling techniques of Parzen. An estimator of the shape parameter of a distribution is also investigated. A regression model for the location and scale parameters is specified, and the resulting estimators of the regression parameters are used to determine a regression function for any quantiles of the observed data. Finally it is shown that inferences about the quantile relationships can be based on the asymptotic normality of the estimated parameters. The procedures are applied to some published data sets. Dissert. Abstr.

N82-12871 Illinois Univ. at Chicago Circle, Chicago.
ON PROBABILITY PROPORTIONAL TO SIZE SAMPLING DESIGNS: THEIR CONSTRUCTION, ALGEBRAIC PROPERTIES, AND APPLICATIONS Ph.D. Thesis
Bing-Ying Lang Lin 1981 78 p
Avail: Univ. Microfilms Order No. 8120568

A special method of sample selection, the so-called probability proportional to size sampling designs (abbreviated to PPS sampling designs) is presented. A sample, flexible, complete class type procedure is devised to construct PPS sampling designs (without replacement) for any sample size. The procedure for constructing a PPS sampling design is described. An algebraic interpretation of PPS sampling designs is described. Utilizing this algebraic interpretation, PPS sampling designs with property (2) are found by solving some related linear programming problems.
Dissert. Abstr.

N82-12872 Kentucky Univ., Lexington.
THE DISTRIBUTION OF QUADRATIC FORMS IN NORMAL VARIABLES WITH APPLICATIONS TO THE COMPARISON OF VARIABLE SELECTION CRITERIA Ph.D. Thesis
Robert Hayes Brown 1981 115 p
Avail: Univ. Microfilms Order No. 8121606

Some existing representations for the distribution function of quadratic forms in normal variables are reviewed and are found to lead to inefficient computational algorithms. In the positive definite case it is shown that these inefficiencies can be overcome through a simple rearrangement in the order of computations. These representations are then extended to the case of indefinite quadratic forms and it is shown that the computational efficiencies carry over to the more general case. Some well-known results concerning the mean squared error function of preliminary test estimates are reviewed and are seen to be restricted to the case where the test statistic is a simple function of the residual sum of squares of the given models. These results are then extended to the more general case where the test statistic is only assumed to be a quadratic form in the observations. The resultant mean squared error function is seen to involve the distribution function of a quadratic form in normal variables. Two variable selection criteria are then compared.
Dissert. Abstr.

N82-12873 Cornell Univ., Ithaca, N. Y.
CONFIDENCE INTERVAL ESTIMATION AND TESTS FOR TEMPORARY OUTMIGRATION IN TAG-RECAPTURE STUDIES Ph.D. Thesis
John Paul Balser 1981 215 p
Avail: Univ. Microfilms Order No. 8119520

A probability model was devised using the conditional distribution of the subsequent recaptures of the marked animals released at the various sample times, given appropriate summary statistics. The test is based on the chi square distribution and the power of the test is approximated for a number of possible parameter configurations by Monte Carlo simulation. The conditional test is derived and its power examined for the multiple recapture experiment as analyzed by the Jolly-Seber method, and for the bird banding study, a type of single recapture census. The power of this test is approximated by Monte Carlo simulation and is compared to that of the conditional test. For the Jolly-Seber method, the maximum likelihood estimate and two unbiased type estimates are examined. It is concluded that the confidence interval based on the natural logarithmic transformation is best for the Jolly-Seber estimate of survival, and that based on the square root transformation is best or the bird banding survival estimate. Dissert. Abstr.

N82-12874# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
DEVELOPMENT AND ANALYSIS OF A MODIFIED SCREENING PROCEDURE TO INCREASE ACCEPTABLE PRODUCT
Youn-Min Chou (Texas Univ. at San Antonio) and D. B. Owen

Aug. 1981 16 p refs
(Contract N00014-76-C-0613)
(AD-A104936; TR-148) Avail: NTIS HC A02/MF A01 CSCL 12/1

Much work has been done on screening procedures under the assumption of a bivariate normal distribution. However, very little effort has been expended on data which are from a truncated bivariate normal distribution. Methods are developed for a screening procedure to increase acceptable product from a truncated distribution. An acceptance criterion on a linear combination of the largest order statistics from a truncated normal population with a given truncation point is discussed. This paper also uses the approximate distribution of the sample correlation coefficient in random samples of any size drawn from a singly truncated bivariate normal distribution to obtain a lower confidence limit on the population correlation coefficient sigma. The screening procedure discussed here is based on knowledge of the truncation point, the sample size and the lower confidence limit for sigma. Author (GRA)

N82-12875# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
ON THE COMPUTATION OF OPTIMAL DESIGNS FOR CERTAIN TIME SERIES MODELS WITH APPLICATIONS TO OPTIMAL QUANTILE SELECTION FOR LOCATION OR SCALE PARAMETER ESTIMATION
Randall L. Eubank, Patricia L. Smith, and Philip W. Smith Jul. 1981 28 p refs Prepared in cooperation with Old Dominion Univ., Norfolk, Va.
(Contract N00014-75-C-0439; Grant DAHC04-75-0816)
(AD-A104935; TR-146) Avail: NTIS HC A03/MF A01 CSCL 12/1

Using the results of Chow (1978) on the optimal placement of knots in the approximation of functions by piecewise polynomials, an algorithm is presented for the computation of optimal designs for certain time series models considered by Eubank, Smith and Smith (1981). The ideas underlying this algorithm form a unified approach to the computation of optimal spacings for the sample quantiles used in the asymptotically best linear unbiased estimator of a location or scale parameter. GRA

N82-12876# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
VARIANCES FOR ADAPTIVE TRIMMED MEANS
John E. Boyer, Jr. Aug. 1981 18 p refs
(AD-A104913; TR-145) Avail: NTIS HC A02/MF A01 CSCL 12/1

Variances for adaptive estimators of the location parameter in a family of symmetric distributions including the uniform, normal, and double exponential are examined at small to moderate sample sizes. The estimators are all trimmed means or means of trimmings where the proportion of trimming is determined by an easily computed measure of nonnormality. Comparisons are made to the asymptotic variances. Author (GRA)

N82-12877# Texas A&M Univ., College Station. Inst. of Statistics.
COMMENTS ON THE MEASUREMENT OF LINEAR DEPENDENCE AND FEEDBACK BETWEEN MULTIPLE TIME SERIES BY JOHN GEWEKE
Emanuel Parzen Jul. 1981 12 p refs Presented at the Am. Statist. Assoc. Ann. Meeting, Detroit, 13 Aug. 1981
(Contracts DAAG29-80-C-0070; N00014-81-MP-10001)
(AD-A104741; TR-N-27) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is a discussion presented August 13, 1981 at the American Statistical Association Annual Meeting in Detroit of an invited paper by John Geweke entitled 'The Measurement of Linear Dependence and Feedback Between Multiple Time Series'. It shows how the results presented by Geweke can be derived and clarified using the approaches to multiple time series modeling published in Parzen (1967), (1969), (1977), and Parzen and Newton (1979). GRA

N82-12878# Texas A&M Univ., College Station. Inst. of Statistics.
THE FINITE MEMORY PREDICTION OF COVARIANCE STATONARY TIME SERIES
H. J. Newton and Marcello Pagano (State Univ. of New York at Buffalo) Apr. 1981 17 p refs
(Contracts DAAG29-80-C-0070; N00014-81-MP-10001; N00014-78-C-0599; Grant NCI CA-28066)
(AD-A105413; TR-N-21) Avail: NTIS HC A02/MF A01 CSCL 12/1

An algorithm is presented for conveniently calculating h step ahead minimum mean square linear predictors and prediction variances given a finite number of observations from a covariance stationary time series Y. It is shown that elements of the modified Cholesky decomposition of the covariance matrix of observations play the role in finite memory prediction that the coefficients in the infinite order moving average representation of Y play in infinite memory prediction. The algorithm is applied to autoregressive-moving average time series where further simplifications are shown to occur. A numerical example illustrating the basic points of the general algorithm is presented. Author (GRA)

N82-12879# Texas A&M Univ., College Station. Inst. of Statistics.
ON SOME NUMERICAL PROPERTIES OF ARMA PARAMETER ESTIMATION PROCEDURES
H. Joseph Newton Jul. 1981 8 p refs
(Contract DAAG29-80-C-0070)
(AD-A104938; TR-N-25) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper reviews the algorithms used by statisticians for obtaining efficient estimators of the parameters of a univariate autoregressive moving average (ARMA) time series. The connection of the estimation problem with the problem of prediction is investigated with particular emphasis on the Kalman filter and modified Cholesky decomposition algorithms. A result from prediction theory is given which provides a significant reduction in the computations needed in Ansley's (1979) estimation procedure. Finally it is pointed out that there are many useful facts in the literature of control theory that need to be investigated by statisticians interested in estimation and prediction problems in linear time series models. Author (GRA)

N82-12880# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands). Afd. Wageningen.
FITTING OF NEGATIVE BINOMIAL DISTRIBUTIONS USING THE APL PROGRAM GRPFITNEG [HET AANPASSEN VAN NEGATIEF BINOMIALE VERDELINGEN MET HET APL-PROGRAMMA GRPFITNEG]
C. J. F. terBraak Delft Netherlands Organization for Applied Scientific Research TNO Sep. 1979 32 p refs In DUTCH
(A-79-ST-44-24) Avail: NTIS HC A03/MF A01

The program calculates the maximum likelihood estimates for parameters of negative binomial distributions and verifies if these distributions have equal expectancy and/or equal form parameters. The estimates are iteratively calculated using the Newton-Raphson method. The program is not suited to very large (>100) values of probability and form parameter. Author (ESA)

N82-12881# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
NORM CONDITIONS FOR THE PATH REGULARITY OF RANDOM PROCESSES
Olav Kallenberg 1981 16 p refs
(CTH-Math-1981-12) Avail: NTIS HC A02/MF A01

Norm continuous L sub p processes of bounded L sub p-variation ($p > 1$) are shown to be absolutely continuous with respect to some fixed measure. Moreover, the rate of convergence of the norm sums for finite interval partitions provides precise information on the sample path behavior of the process and its density, such as Lipschitz conditions on the process or its density, and absolute continuity of the density. A basic role is played by a general norm inequality for L sub p random variables of independent interest. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-12882 Pennsylvania State Univ., University Park.
LARGE-SCALE SYSTEMS OPTIMIZATION USING NONLINEAR INTEGER GOAL PROGRAMMING METHODS Ph.D. Thesis
Charles Hulbert Alvord, III 1981 199 p
Avail: Univ. Microfilms Order No. 8120397

Hybrid algorithms for solving large scale optimization problems which contain nonlinear constraints and/or objectives and discrete decision variables are presented. Goal programming fundamentals are used and several heuristics are combined with the modified Hooke-Jeeves pattern search technique. Nonlinear programming methods, discrete optimization methods, and heuristics are reviewed. Each method is evaluated for suitability in the content of a nonlinear integer goal programming algorithm. Arguments on the computational complexity of heuristic methods are summarized. The algorithm is applied to two real world large scale multi-objectie optimization problems, the system partitioning problem and the distributed processing design problem. The algorithm's performance is shown empirically for these problem types. Dissert. Abstr.

N82-12883 Illinois Univ. at Chicago Circle, Chicago.
SATISFACTORY SOLUTIONS APPROACH TO CONTROL AND OPTIMIZATION OF LARGE-SCALE SYSTEMS Ph.D. Thesis
Nachappagounder Gopalsami 1981 152 p
Avail: Univ. Microfilms Order No. 8120565

The design of decentralized control structures with minimum communication links among the controllers is considered. The decomposition of a large system problem into subproblems corresponding to subsystems and the coordination of the solution of these subproblems to obtain the overall solution is described. A multilevel feedback scheme is considered, in which the subsystems are decoupled by ignoring the interactions and the local controllers are designed in an optimal control theoretic setup. These subsystems are then interconnected and coordinated using the interaction variables in a feedback form. The degree of suboptimality of the derived control law can be inferred from a theoretical result, which provides a lower as well as an upper bound on the optimal index. An alternate approach to coordination is devised to make use of the cooperative aspect of the subsystems. The necessary mathematical framework to define and quantify a satisfactory solution is developed by considering a parameter optimization problem with a vector type of performance index. Numerical examples are presented to illustrate the solutions approach. A decentralized type of control for an interconnected power system is devised. Dissert. Abstr.

N82-12884# Stanford Univ., Calif. Center for Research on Organizational Efficiency.
TOPICAL SURVEY, 1980-1981 Progress Report
Mar. 1981 36 p refs
(Contract N00014-79-C-0685)
(AD-A105117) Avail: NTIS HC A03/MF A01 CSCL 12/1

The work at the center on game-theoretic models of multiperson decision problems has strengthened the analytical tools available to study the phenomena of organizations. There are bright prospects that several of the more intractible topics can be addressed a new with better chances of clear-cut resolution. To take a specific example, we are particularly interested in developing the theory of bargaining modeled as a dynamic game with incomplete information. That is, bargaining or negotiations are typically affected by incomplete information about each other's preferences, resources, and opportunities. At the same time, bargaining is inherently a dynamic process of offers and counteroffers, perhaps interrupted by combative tactics (strikes, lockout, 'war'). It seems clear that the analysis of such a model can proceed smoothly along the lines developed in work to date. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-12885*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NUMERICAL SOLUTION FOR TWO-DIMENSIONAL FREDHOLM INTEGRAL EQUATIONS OF THE SECOND KIND WITH KERNELS OF THE LOGARITHMIC POTENTIAL FORM
Ralph E. Gabrielsen and Aynur Uenal Nov. 1981 10 p refs
(NASA-TM-81299; USAAVRADCOM-TR-81-A-20; A-8603)
Avail: NTIS HC A02/MF A01 CSCL 12A

Two dimensional Fredholm integral equations with logarithmic potential kernels are numerically solved. The explicit consequence of these solutions to their true solutions is demonstrated. The results are based on a previous work in which numerical solutions were obtained for Fredholm integral equations of the second kind with continuous kernels. Author

N82-12886# Carnegie-Mellon Univ., Pittsburgh, Pa. Graduate School of Industrial Administration.
OPTIMAL INTEGER AND FRACTIONAL COVERS: A SHARP BOUND ON THEIR RATIO
Egon Balas May 1981 12 p
(Contract N00014-75-C-0621; NR Proj. 047-048)
(AD-A104829; MSRR-475) Avail: NTIS HC A02/MF A01 CSCL 12/1

The ratio of the values of optimal integer and fractional solutions to a set covering problem was shown by Johnson and Lovasz to be bounded by B(d) = 1 + ln(d), where d is the largest column sum. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-12887# GTE Labs., Inc., Waltham, Mass.
FUNDAMENTALS OF MAGNETIC INTERACTIONS: NEW APPROACHES TO THEORY AND EXPERIMENT Final Report, 16 Jun. 1979 - 14 Jun. 1981
A. Lempicki, W. J. Miniscalco, B. C. McCollum, E. J. Johnson, R. W. Davies, R. Gamache (Lowell Univ.), S. J. Nettel (Rensselaer Polytechnic Inst.), and N. Sanford (Rensselaer Polytechnic Inst.)
Aug. 1981 69 p refs
(Contract F49620-79-C-0182; AF Proj. 2301)
(AD-A105003; AFOSR-81-0676TR) Avail: NTIS HC A04/MF A01 CSCL 20/3

Optically induced changes in magnetization (optomagnetism) have been observed for CdCr2Se4 and several other magnetic semiconductors. The effect has never been adequately explained although the most likely cause is RKKY coupling through optically excited carriers. Optomagnetism and other manifestations of carrier-spin interaction are intimately related to the electronic structure of these materials, particularly the narrow d and f bands. Realistic theories of these effects are lacking, in part because of the controversy surrounding the electronic structure of many of these materials. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-12888 Johns Hopkins Univ., Baltimore, Md.
INVESTIGATIONS OF THE REFLECTION, TRANSMISSION, AND CONVERSION OF ULTRASONIC WAVES Ph.D. Thesis
Hugh Miles South 1981 134 p
Avail: Univ. Microfilms Order No. 8120048

A theory describing the reflection, transmission, and mode conversion of surface waves at the corners of wedges is developed. The theory is an asymptotic one, and the mathematics is developed for two regions of wedge: near the apex and far from the apex. The reflection and transmission coefficients of the surface waves are calculated and are shown to compare favorably with experimental results. The partition of power between the various wave types is also calculated. This partition provides a good check on the internal consistency of the theory. Next a optical technique for the measurement of bulk waves is described, and measurements using this technique are presented. The relationship between bulk waves and the optical properties of the sample material is then examined in detail. Experimental results are presented to confirm the theoretical predictions. Dissert. Abstr.

N82-12889*# National Aeronautics and Space Administration. Pasadena Office, Calif.

ACOUSTIC SYSTEM FOR MATERIAL TRANSPORT Patent Application

Martin B. Barmatz (JPL, California Inst. of Tech., Pasadena), Eugene Trinh (JPL, California Inst. of Tech., Pasadena), Taylor G. Wang (JPL, California Inst. of Tech., Pasadena), Daniel D. Ellman (JPL, California Inst. of Tech., Pasadena), and Nathan Jacobi, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Oct. 1981 17 p

(Contract NAS7-100)

(NASA-Case-NPO-15453-1; US-Patent-Appl-SN-314929) Avail: NTIS HC A02/MF A01 CSCL 20A

An object within a chamber is acoustically moved by applying wavelengths of different modes to the chamber to move the object between pressure wells formed by the modes. In one system, the object is placed in one end of the chamber while a resonant mode, applied along the length of the chamber, produces a pressure well at the location. The frequency is then switched to a second mode that produces a pressure well at the center of the chamber, to draw the object. When the object reaches the second pressure well and is still traveling towards the second end of the chamber, the acoustic frequency is again shifted to a third mode (which may equal the first mode) that has a pressure well in the second end portion of the chamber, to draw the object. A heat source may be located near the second end of the chamber to heat the sample, and after the sample is heated it can be cooled by moving it in a corresponding manner back to the first end of the chamber. The transducers for levitating and moving the object may be all located at the cool first end of the chamber. NASA

N82-12890*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NUMERICAL TECHNIQUES IN LINEAR DUCT ACOUSTICS, 1980-81 UPDATE

Kenneth J. Baumeister 1981 51 p refs Presented at the 102 Winter Ann. Meeting, Washington, D.C., 15-20 Nov. 1981; sponsored by ASME

(NASA-TM-82730; E-1034) Avail: NTIS HC A04/MF A01 CSCL 20A

A review is presented covering finite element and finite difference analysis of small amplitude (linear) sound propagation in straight and variable area ducts. This review stresses the new work performed during the 1980-1981 time frame, although a brief discussion of earlier work is also included. Emphasis is placed on the latest state of the art in numerical techniques. Author

N82-12891*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VERIFICATION OF AN ACOUSTIC TRANSMISSION MATRIX ANALYSIS OF SOUND PROPAGATION IN A VARIABLE AREA DUCT WITHOUT FLOW

J. H. Miles 1981 15 p refs Presented at the 102 Meeting of the Acoustical Soc. of Am., Miami Beach, Fla., 1-4 Dec. 1981

(NASA-TM-82741; E-1053) Avail: NTIS HC A02/MF A01 CSCL 20A

A predicted standing wave pressure and phase angle profile for a hard wall rectangular duct with a region of converging-diverging area variation is compared to published experimental measurements in a study of sound propagation without flow. The factor of 1/2 area variation used is sufficient magnitude to produce large reflections. The prediction is based on a transmission matrix approach developed for the analysis of sound propagation in a variable area duct with and without flow. The agreement between the measured and predicted results is shown to be excellent. Author

N82-12892# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.

REGIONAL DEPENDENCE OF VERY LOW-FREQUENCY SOUND ATTENUATION IN THE DEEP SOUND CHANNEL: CORRELATION WITH INTERNAL WAVE MEASUREMENTS

David G. Browning, Michael J. Fecher, and Robert H. Mellen 22 Sep. 1981 16 p Conf. held at Honolulu, Hawaii, 27 Nov. - 1 Dec. 1978

(AD-A105061; NUSC-TD-6561) Avail: NTIS HC A02/MF A01 CSCL 20/1

The most promising mechanism for the very low-frequency sound attenuation observed in the deep sound channel is diffusive scattering by internal waves, Mellen, et al. (1976) have obtained estimates for the extra attenuation using the Garrett-Munk internal wave model and found consistency with the lower experimental values reported. Kibblewhite, et al. (1978) have shown a definite regional dependence in the Pacific. This paper compares regional oceanographic measurements with the Garrett-Munk internal wave model and also correlate local acoustic measurements with estimates of the extra attenuation. GRA

N82-12893# Georgetown Univ., Washington, D.C. Dept. of Physics.

SOME ASPECTS OF ULTRASONIC NONSPECULAR REFLECTION Technical Report, 15 Oct. 1980 - 30 Sep. 1981

Walter G. Mayer and Tran D. K. Ngoc Oct. 1981 18 p refs

(Contract N00014-78-C-0584)

(AD-A105225; GUUS-10814) Avail: NTIS HC A02/MF A01 CSCL 20/1

A general description is given of the ultrasonic nonspecular reflection and transmission effects for layered media. This description forms the basis for evaluation, via acoustooptic interaction techniques to measure reflectivity from solid plates in a liquid and also for the detection of local inhomogeneities of the plate. Author (GRA)

N82-12894# Southampton Univ. (England).

RESEARCH ACTIVITIES REPORT OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH Annual Report

1981 75 p refs

Avail: NTIS HC A04/MF A01

A list of research areas in acoustics is furnished including: fluid dynamics and acoustics; automotive engineering; audiology and human effects; and structures and machinery. A compendium of computer programs with details of use, language, etc., is appended. Current projects on noise reduction and noise effects are ennumerated. Author (ESA)

N82-12895# Statens Provningsanstalt, Goraas (Sweden).

MEASUREMENT OF SOUND ABSORPTION OF SCREENS

Hans Jonasson Dec. 1979 53 p refs

(SP-RAPP-1979-31) Avail: NTIS HC A04/MF A01

A method for measurement in a reverberation room is given. Screens are randomly arranged in discrete positions with a minimum distance of 2 m between them. No screen is closer than 1 m to any reflecting surface. The measurements are carried out in 1/3 octave bands in the frequency range 100 to 5000 Hz. Below 300 Hz separate measurements with at least two sound sources, 3m apart, are made. Recordings are made with at least five microphone positions. Minimum number of decays for each frequency band is 10. A significant difference is shown between in-line and discrete positioning of screens. Discrete positions are recommended. Author (ESA)

N82-12896# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

EFFECT OF THE ORIENTATION OF THE SPEAKER'S HEAD AND AZIMUTH OF A NOISE SOURCE ON THE SPEECH RECEPTION THRESHOLD FOR SENTENCES

R. Plomb and A. M. Mimpen 1980 12 p refs Submitted for publication

(IZF-1980-18; TDCK-75015) Avail: NTIS HC A02/MF A01

The speech reception threshold (SRT) for sentences in a free field condition was investigated as a funcion of (1) the orientation of the speaker's head, and (2) the azimuth of a noise source, with the listener always looking in the direction of the speaker. A miniature electric microphone with a flat frequency response was glued to the upper lip of a pseudospeaker standing 2 m from a loudspeaker. For each of ten directional orientations of the pseudospeaker, corresponding to angles, of zero deg, 22.5 deg, 45 deg, 90 deg, and 180 deg relative to the loudspeaker, a list of 13 sentences was reproduced and rerecorded through the microphone. Results show that (1) the maximum effect of direction in speech radiation from the mouth of the speaker is, in terms of signal to noise ratio, 6 dB, and (2) the maximum effect of the azimuth of the noise source is 10 dB.

Author (ESA)

N82-12897# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 7: Acoustics.

NONLINEAR INTERACTION OF SOUND WAVES IN WATER: EXPERIMENTS WITH PARAMETRIC ARRAYS

J. Verbiest, P. L. Rosenkranz, and J. M. H. Theunissen Oct. 1979 61 p refs

(PHL-1979-44; TDCK-73423) Avail: NTIS HC A04/MF A01

The theory of nonlinear interaction of sound waves and approaches to numerical prediction of parametric sound generation in water are presented. Lighthill's wave equation, nonlinearity in fluids, second order wave equations, collinear plane waves, attenuation effects, and calculation of the second order sound field are discussed. Sound pressure is measured as a function of range and azimuth angle with a hydrophone. A discrepancy between measured and predicted curves based on difference frequencies is shown. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-12898# Arizona Univ., Tucson. Optical Sciences Center.

TIME-OF-FLIGHT SPECTROSCOPY OF MOLECULAR STRUCTURE, COLLISION PROCESSES AND GAS-SURFACE INTERACTIONS Annual Technical Report, 15 Jun. 1980 - 14 Jun. 1981

Willis E. Lamb, Jr. and Laurence C. McIntyre, Jr. 15 Jul. 1981 9 p

(Grant AF-AFOSR-0218-80; AF Proj. 2301)

(AD-A105438; AFOSR-81-0644TR) Avail: NTIS HC A02/MF A01 CSCL 20/7

Progress is reported on research in molecular physics involving electron-bombardment molecular dissociation. The velocity distribution of metastable and ionic fragments are measured using a pulsed electron beam and a time-of-flight technique. Fragments from the hydrogen molecule and its deuterated forms have been investigated using electron energies from 30 to 100 electron-volts. Dissociation channels via particular molecular or molecular ion excited states have been proposed to explain observed features in the velocity spectra. A similar experiment involving hydrogen fragments from the hydrogen halides is also in progress. Preliminary data show several resolved velocity groups indicating the presence of multiple dissociating channels. Experiments using water and hydrogen sulfide molecules are also underway. Finally, we are continuing to develop our ion mass filter which allows us to obtain separate ion velocity distributions for each mass in a situation in which several ion masses are present. Author (GRA)

N82-12899# California Univ., Berkeley. Dept. of Chemistry

INTERACTION POTENTIALS BETWEEN RARE GAS ATOMS AND HOLOGEN ATOMS Final Report, 1 Dec. 1977 - 1 Dec. 1980

Yuan T. Lee 10 Jun. 1981 75 p refs

(Contract N00014-77-C-0101)

(AD-A104836) Avail: NTIS HC A04/MF A01 CSCL 20/7

Interaction potentials are investigated for F + Ne, Ar, Kr, Xe, Cl + Xe and Br + Ar, Kr, Xe from the measurements of elastic differential cross sections in crossed molecular beams experiments. The general trend of the transition from van der Waals interactions to chemical interactions is carefully examined. Author (GRA)

N82-12900# Colorado State Univ., Fort Collins. Dept. of Chemistry.

OXYGEN INDUCED TRIPLET STATE TRANSITIONS OF BENZENE IN CRYOGENIC SOLUTIONS

J. Lee and E. R. Bernstein 16 Sep. 1981 21 p refs Submitted for publication Sponsored in part by ONR and NSF

(Contract N00014-79-C-0647)

(AD-A105432; TR-4) Avail: NTIS HC A02/MF A01 CSCL 07/3

A new way of investigating the oxygen induced triplet state transitions of simple organic molecules is presented. The method involves dissolving the organic along with oxygen in hydrocarbon liquids such as propane, ethane, or propene. Both triplet B(1u) from singlet A(1g) and triplet E(1u) from singlet A(1g) transitions of C6H6 and C6D6 are studied in this work. These results indicate that both triplet states and their vibrational spacings are quite sensitive to the environment. The suggested dominant feature of the triplet B(1u) state of C6H6 is nu(8) (916 per cm) of e(2g) symmetry. Observed triplet state intensity enhancement is believed to be due to a non-statistical oxygen/benzene van der Waals complex formed in the low temperature liquid.

Author (GRA)

N82-12901# Naval Research Lab., Washington, D. C.

DYNAMICS OF AN INTENSE RELATIVISTIC ELECTRON BEAM INJECTED INTO FULL DENSITY AIR

R. B. Fiorito, E. W. Fordham, J. R. Greig, R. E. Pechacek, J. D. Sethian, R. F. Fernsler, and J. C. Halle 21 Sep. 1981 43 p refs

(RR0110941)

(AD-A104743; NRL-MR-4557) Avail: NTIS HC A03/MF A01 CSCL 20/8

We have injected an intense relativistic electron beam (about 1 Mev, 16 kA, 25 ns) into the atmosphere and observed the beam in visible light caused by direct beam excitation of air molecules. The emitted visible light was primarily emission in the 2nd positive system of N2 which was delayed with respect to the beam current by about 6 ns but had the same duration (FWHM) as the beam current. Streak photographs of the beam in this visible light were taken with an Imacon 790 camera at various axial positions with a camera time resolution of about 1 ns. These photographs show that the beam remained a single current filament which oscillated about its initial direction as it propagated through the atmosphere, and that while the 'body' of the beam was pinched to a radius of < or = 5 cm the 'nose' was expanded to give the characteristic trumpet-like shape. Beam and net current monitors were used to determine the beam current and the plasma return current whose peak value was > or = 60% of the peak beam current. Comparison of the measured net current to that predicted from the calculated air conductivity and a simple circuit model to represent the beam propagating in the atmosphere showed good agreement provided a transmission line model including the capacitance of the beam in the ionized atmosphere was used. Author (GRA)

N82-12902# Sandia Labs., Albuquerque, N. Mex. Theoretical Div.

BREMSSTRAHLUNG ENERGY SPECTRA FROM ELECTRONS OF KINETIC ENERGY 1 keV LESS THAN OR EQUAL TO T LESS THAN OR EQUAL TO 2000 keV INCIDENT ON NEUTRAL ATOMS 1 LESS THAN OR EQUAL TO Z LESS THAN OR EQUAL TO 92

Lynn Kissel, Crawford MacCallum, and R. H. Pratt (Pittsburgh Univ.) Aug. 1981 73 p refs

(Contract DE-AC04-76DP-00789)

(DE81-030984; SAND-81-1337) Avail: NTIS HC A04/MF A01

Theoretical predictions for the electron bremsstrahlung energy spectrum from neutral atoms as a function of atomic number Z, incident electron kinetic energy T, and fraction of energy radiated k/T (k is the emitted photon energy) were tabulated. Values for

2 less than or equal to Z less than or equal to 92 were obtained by interpolation from a smaller set of calculated data points. The calculated points were obtained by describing bremsstrahlung as a single-electron transition in a relativistic self-consistent screened potential. Tabulated values for Z = 1 are obtained from the formfactor corrected Born approximation times the Elwert Factor. The tables correct errors found in a previous tabulation. Various plots of the tabulation are presented and the general behavior of the energy sspectrum is discussed. Energy scaling of the spectrum is investigated and T/Z is found to best scale the data. DOE

N82-12903# Oak Ridge National Lab., Tenn. Engineering Physics Div.

PAPIN: A FORTRAN-4 PROGRAM TO CALCULATE CROSS SECTION PROBABILITY TABLES, BONDARENKO AND TRANSMISSION SELF-SHIELDING FACTORS FOR FERTILE ISOTOPES IN THE UNRESOLVED RESONANCE REGION

J. G. Munoz-Cobos Aug. 1981 41 p refs

(Contract W-7405-eng-26)

(DE81-030436; ORNL/TM-7883; ENDF-310) Avail: NTIS HC A03/MF A01

A FORTRAN 4 code was developed to calculate cross section probability tables, Bondarenko self-shielding factors, and average self-indication ratios for non-fissile isotopes, below the inelastic threshold, on the basis of prescriptions for the unresolved resonance region. Monte-Carlo methods are utilized to generate ladders of resonance parameters in he unresolved resonance region, from average resonance parameters and their appropriate distribution functions. The neutron cross sections are calculated by the single level Breit-Wigner formalism, with s, p and d-wave contributions. The cross section probability tables are constructed by sampling the Doppler-broadened cross sections. The various self-shielded factors are computed numerically as Lebesgue integrals over the cross section probability tables. The program was validated through extensive comparisons with several deterministic codes. DOE

N82-12904# Oak Ridge National Lab., Tenn. Physics Div.

DESCRIPTION AND USE OF THE MONTE CARLO CODE LILITA

J. GomezdelCampo and Robert G. Stokstad Sep. 1981 42 p refs

(Contract W-7405-eng-26)

(DE81-030704; ORNL/TM-7295) Avail: NTIS HC A03/MF A01

Two major applications of the code LILITA were developed. The first is the prediction of relative yields, computer energy spectra and angular distributions of evaporation residues and light particles (alphas, protons and neutrons) produced in a heavy-ion compound-nuclear reaction. The second consists of modeling the equilibrium decay of excited fragments produced in a two-body collision (such as quasi-elastic or deep inelastic scattering). The equilibrium decay of the reaction products is calculated by using the Hauser-Feshbach formula in conjunction with the Monte Carlo method. The approximations used in evaluating the Hauser-Feshbach formula and its use in conjunction with the Monte Carlo method are described. A description of the program input and a discussion of the event-by-event calculations are given. The processing of the event-by-event file used for coincidence calculations, either for fusion reactions or for two-body inelastic collisons is described. Comments on the parameters used for the statistical model calculations are given, and the flow diagram of the code is discussed. DOE

N82-12905# Massachusetts Univ., Amherst.

NUCLEAR STRUCTURE STUDIES BY THE SCATTERING OF MEDIUM-ENERGY ELECTRONS Progress Report, 1 Oct. 1980 - 31 Jul. 1981

G. A. Peterson Aug. 1981 33 p refs

(Contract DE-AC02-76ER-02853)

(DE81-030058; DOE/ER-02853/T1) Avail: NTIS HC A03/MF A01

Both magnetic elastic and transverse inelastic scattering cross sections were measured. A liquid-nitrogen-cooled gas target is used in a study of deuteron elastic magnetic scattering and electrodisintegration over a large energy range. A measurement of elastic magnetic and transverse inelastic scattering from N-14 was started. Measurements of the elastic magnetic scattering from C-13, N-15, Al-27, Si-29, and P-31 were completed. The data set on N-15 inelastic scattering are now complete and analysis of the data is in progress. A study of M8 transitions in Fe-54 and Ni-60 is nearing completion. A measurement of the transverse quasi-elastic scattering from Fe-56 was started. Large-basis shell model calculations pertaining to the above nuclei and others were made. Theoretical calculations of exchange currents, nuclear convection currents, and other nuclear phenomena are in progress. Finally, considerations are being given to the design of an integrated storage-ring-experimental system. DOE

N82-12906# Los Alamos Scientific Lab., N. Mex.

INCLUSIVE PROTON SPECTRA AND TOTAL REACTION CROSS SECTIONS FOR PROTON-NUCLEUS SCATTERING AT 800 MeV

John Alexander McGill Aug. 1981 103 p refs

(Contract W-7405-eng-36)

(DE81-030505; LA-8937-T) Avail: NTIS HC A06/MF A01

Current applications of multiple scattering theory to describe the elastic scattering of medium energy protons from nuclei are shown to be quite successful in reproducing the experimental cross sections. These calculations use the impulse approximation, wherein the scattering from individual nucleons in the nucleus is described by the scattering amplitude for a free nucleon. Such an approximation restricts the inelastic chennels to those initiated by nucleon-nucleon scattering. As a first step in determining the nature of p + nucleus scattering at 800 MeV, both total reaction cross sections and (p,p) inclusive cross sections were measured and compared to the free p + p cross sections for hydrogen, deuterium, and compared to the free p + p cross sections for hydrogen, deuterium, calcium 40, carbon 12, and lead 206. It is concluded that as much as 85% of all reactions in a nucleus proceed from interactions with a single nucleon in the nucleus, and that the impulse approximation is a good starting point for a microscopic description of p + nucleus interactions at 800 MeV. DOE

N82-12907# Denison Univ., Granville, Ohio.

NEUTRON CROSS SECTION MEASUREMENTS USING THE ORELA: THE STABLE TELLURIUM ISOTOPES (N, BETA), U(N,N')-238, TH(N,N')-232, OS(N,N')-187, OS(N,NN' BETA)-186,187,188, AND TI(N,N BETA)-205 Progress Report, 1 Sep. 1980 - 1 Sep. 1981

R. R. Winters Aug. 1981 7 p ref

(Contract DE-AC02-76ER-02696)

(DE81-030164; DOE/ER-02696/11) Avail: NTIS HC A02/MF A01

A computer code which calculates the optical phase shifts from the observed widths and external B-function was written and used in a reanalysis of the S-32 + n data. Optical model potential well depths were found to agree with previous findings. Interpretation of the optical phase shifts analysis did not. Microstructure calculations which at least include coupling between the collective states of the deformed nucleus and the single particle states were warranted. Renormalization of neutron capture cross sections is reported. Measurement of the Ar-40 total cross section was completed the data analysis begun. N.W.

N82-12908# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

DIFFUSION OF GASES IN CAPILLARIES Ph.D. Thesis

Nathan S. Jacobson Aug. 1981 108 p refs

(Contract W-7405-eng-48)

(DE82-000267; LBL-13227) Avail: NTIS HC A06/MF A01

Two aspects of the diffusion of gases in capillaries are explored. A Monte Carlo computer simulation of Knudsen flow is adapted to count collisions and record collision distributions. The behavior of gases in both open and closed end tubes is examined. Given a tube with one end closed and a length-to-radius ratio of L/R, it is shown that a molecule entering this tube will strike the wall an average of 2 L/R times before escaping and that most molecules do not travel vary far into the pore. Those reaching the pore bottom usually strike the walls many times before escaping. The average number of collisions a molecule undergoes in passng through an open-end capillary is also calculated. If the reaction probability is already known, the

processes in a supported catalyst can be simulated. From this analysis the distribution of active material, pore size, and pellet diameter can be optimized for a given reaction. Knudsen and surface diffusion in porous alumir.ia is studied. Measurements of surface diffusion are shown to be temperature dependent.
DOE

N82-12909# Oak Ridge National Lab., Tenn. Fusion Energy Div.
MONTE CARLO SIMULATION OF MOLECULAR FLOW IN A NEUTRAL-BEAM INJECTOR AND COMPARISON WITH EXPERIMENT
R. A. Lillie, T. A. Gabriel, S. W. Schwenterly, R. G. Alsmiller, Jr., and R. T. Santoro Sep. 1981 30 p refs Submitted for publication
(Contract W-7405-eng-26)
(DE82-000503; ORNL/TM-7911) Avail: NTIS HC A03/MF A01

Monte Carlo calculations were performed to obtain estimates of the background gas pressure and molecular number density as a function of position in the prototype neutral beam injector. Estimates of these quantities together with the transient and steady state energy deposition and molecular capture rates on the cryopanels of the cryocondensation pumps and the molecular escape rate from the injector were obtained utilizing a detailed geometric model of the neutral beam injector. The molecular flow calculations were performed using an existing Monte Carlo radiation transport code which was modified slightly to monitor the energy of the background gas molecules. The credibility of these calculations was demonstrated by the excellent agreement between the calculated and experimentally measured background gas pressure in front of the beamline calorimeter located in the downstream drift region of the injector. The usefulness of the calculational method as a design tool was illustrated by a comparison of the integrated beamline molecular density over the drift region of the injector for three modes of cryopump operation.
DOE

N82-12910# Oak Ridge National Lab., Tenn. Fusion Energy Div.
ELECTRODE DESIGN AND PERFORMANCE OF THE ORNL POSITIVE ION SOURCES
J. H. Whealton, W. L. Gardner, H. H. Haselton, M. M. Menon, P. M. Ryan, D. E. Schechter, W. L. Stirling, C. C. Tsai, W. K. Dagenhart, and N. S. Ponte Aug. 1981 84 p refs
(Contract W-7405-eng-26)
(DE81-030426; ORNL/TM-7879) Avail: NTIS HC A05/MF A01

Four 50-kV, 100-A sources to be used for neutral beam heating of the confined plasma on Tokamak device were constructed. These sources have higher current capability than scaled down sources, and they are required to run for 0.5 s as opposed to the 0.3 s requirement for other sources. Due to an innovative electrode design, these higher power sources met these requirements and achieved a higher transmission efficiency - 76% of the total input power on target. Using the same electrode design with a tetrode accelerating structure and an indirectly heated cathode, repeatable long pulse, high energy conditions of 70 kV, 7 A, 8 s, and 90 kV, 9 A, 5 s were achieved. Grid deformation calculations and Monte Carlo beam blocking, direct recovery device is described, and theoretical considerations of it are discussed.
DOE

N82-12911# Minnesota Univ., Minneapolis.
NUCLEAR STRUCTURE STUDY AT INTERMEDIATE ENERGIES Annual Progress Report, Nov. 1980 - Jul. 1981
N. M. Hintz 1981 128 p refs
(Contract DE-AS02-77ER-04215)
(DE81-030156; DOE/ER-04215/5) Avail: NTIS HC A07/MF A01

Experiments included high resolution spectrometer development; proton scattering on 2s- 1d shell nuclei at 800 MeV; proton scattering from heavy deformed nuclei; measurement of spin-flip probabilities in inelastic scattering; inelastic scattering at 333 and 500 MeV; and computer program development and theoretical analysis.
DOE

N82-12912# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
DETERMINATION OF A POTENTIAL MODEL FOR THE CALCULATION OF INTERATOMIC POTENTIALS IN THE CASE OF ALKALI-RARE GAS INTERACTION [UNTERSUCHUNGEN ZUR ERMITTLUNG EINES MODELLPOTENTIALS FUER DIE BERECHNUNG VON ZWISCHENATOMAREN POTENTIALEN BEI DER ALKALI-EDELGAS WECHSELWIRKUNG]
R. Dueren Sep. 1980 23 p refs In GERMAN
(MPIS-16/1980; ISSN-0436-1199) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,45

A review of potential calculations and exerimental work is given. Taking for example the system Na-Ar, the difference between the calculated potentials and the experimental values for the ground state and the first excited state approach the experimental errors. All matrix elements are correctly numerically integrated. The Hartree-Fock wave functions are used instead of the Bates-Bamgaard wave functions, and quadrupole and dynamic dipole polarizability are included in the charge-induced part of the interaction.
Author (ESA)

N82-12913# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL DEMONSTRATION OF FESHBACH RESONANCES IN ATOM-MOLECULE SCATTERING, WITH THE HELP OF MEASUREMENTS ON THE H2(pH2)-Kr AND HD-Xe SYSTEMS [AUSLEGUNG EINES EXPERIMENTS ZUM NACHWEIS VON FESHBACHRESONANZEN IN DER ATOM - MOLEKUEL STREUUNG MIT MESSUNGEN AN DEN SYSTEMEN H2(pH2)-Kr UND HD-Xe]
Klaus Mueller Sep. 1980 96 p refs In GERMAN
(MPIS-14/1980; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17,40

An experimental scattering device was developed and used to determine closed channel (Feshbach) resonances in systems belonging to the outer range which require a high energy resolution and apparatus time constant. A primary blast nozzle source with a broad velocity range and a high time constant was developed and tested on the known H2-Kr system whose integral scattering cross section was determined with a 2.2% resolution. Theoretical background and detailed apparatus description are presented. To determine Feshbach resonances the integral scattering cross sections of the p-H2-Kr and HD-Xe systems were measured with an energy resolution from 1.9 to 2.2% in the range of the $j=0$ to 2 rotation transition, which is not sufficient to prove these resonances. Several improvements of the apparatus are required.
Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N82-12914 Arizona Univ., Tucson.
APPLICATION AND DESCRIPTION OF THE INTERACTING BOSON MODEL Ph.D. Thesis
Philip Dewitt Duval 1981 140 p
Avail: Univ. Microfilms Order No. 8120729

The principles and phenomenology of the interacting boson model (IBM) are reviewed. The basic model is applied to the even tungsten isotopes and compared with experimental observables associated with the low-lying states. These observable include transition rates, branching ratios, rho(EO) values, quadrupole moments of the first two excited 2(+) states, two-neutron separation energies, and isomer and isotope shifts. The results agree with the experimental data. The IBM is extended to describe configuration mixing two sub-shells. The predictions for the IBM parameters dependent on neutron number are seen to be in better agreement with empirically determined values than the predictions for the single i-shell (the proton-number

dependent parameters are not treated). The interacting boson-fermion model for describing nuclei with an odd number of protons or neutrons is introduced. Dissert. Abstr.

N82-12915 Cornell Univ., Ithaca, N. Y.
AXIAL TRANSLATION OF FIELD-REVERSING RELATIVISTIC ELECTRON RINGS Ph.D. Thesis
Donald John Rej 1981 287 p
Avail: Univ. Microfilms Order No. 8119449

As a consequence of experiments: (1) rings were generated for the first time in a low pressure ambient neutral gas (-10 mTorr H1 and D2), increasing their collisionally limited field-reversal times to over 1 millisecond or more than five times over that previously observed; (2) the first experimental test of adiabatic magnetic compression resulted in greater than factor of ten increases in the ring kinetic energy densities; and (3) two axially separted nonfield-reversed rings, generated from a single accelerator pulse, were successfully combined or stacked to form one field-reversed ring. A quantitative analysis of the translation data is made using retarding force calculations. The rings moved axially at the terminal speed associated with a balance between the accelerating and retarding forces. Conditions were found where the major contribution to the retarding force was due to either the resistive wall or plasma currents. The wall (plasma) force dominated when the rings were moved through the low (high) pressure background gas and inside of the higher (lower) conductivity wall. Dissert. Abstr.

N82-12916*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND SYSTEM FOR NUCLEAR WASTE DISPOSAL Patent Application
Taylor G. Wang, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 30 Oct. 1981 9 p
(Contract NAS7-100)
(NASA-Case-NPO-15454-1; US-Patent-Appl-SN-315586) Avail: NTIS HC A02/MF A01 CSCL 18G

A method and system for disposing of nuclear waste are described which comprised the encasement of small quantities of waste in spheroids containing lead. The spheroids may be formed of different materials preferably of high compressibility strength, including glass and stainless steel. The spheroids may be formed of any of these materials and coated with or lined by lead. NASA

N82-12917# Comptroller General of the United States, Washington, D.C.
IS SPENT FUEL OR WASTE FROM REPROCESSED SPENT FUEL SIMPLER TO DISPOSE OF?
12 Jun. 1981 66 p
(EMD-81-78) Avail: NTIS HC A04/MF A01

One of the highest priority programs of the Federal Government is to devise a waste disposal scheme that will guarantee the permanent isolation of both high level nuclear wastes and spent fuels. The GAO believes it makes sense that spent fuel not be buried in a repository, but be reprocessed to recover the valuable uranium and plutonium. An important factor in this decision is the future role of commercial nuclear power in the United States. Until Congress makes a decision on this issue, DOE has no option but to plan for any eventuality, including the potential geological disposal of spect fuel. Other long term storage options are available which would keep spent above above ground easily acceptable for future use. A.R.H.

N82-12918# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
EXPERIMENTS WITH WAVES ON RELATIVISTIC ELECTRON BEAMS Final Report, 1 Oct. 1979 - 30 Sep. 1980
J. L. Hirshfield 1 Jan. 1981 18 p refs
(Grant AF-AFOSR-0025-80; AF Proj. 2301)
(AD-A105094; AFOSR-81-0641TR) Avail: NTIS HC A02/MF A01 CSCL 20/7

Installation of the Febetron electron accelerator, vacuum chamber, axial guide magnetic field, and pulsed magnetic wiggler is complete. Diode current and voltage diagnostics have been developed. Cathode designs have begun to produce low current (100's) of amperes) beams of low emittance. A novel 90 degree deflection momentum analyzer has been designed to determine the momentum spread for a sample of the beam. Low current cw beams in the energy range 4-20 keV were employed to determine electron orbits in the wiggler/guide field combination. Beam analyzers were designed and employed to distinguish orbit deflection and helicity. GRA

N82-12919# Sandia Labs., Albuquerque, N. Mex.
PHOENIX 2 ENERGY EXTRACTION AND ANGULAR MULTIPLEXING EXPERIMENTS
James M. Hoffman and Gerald N. Hays Aug. 1981 49 p refs
(Contract DE-AC04-76DP-00789)
(DE81-028972; SAND-81-1472) Avail: NTIS HC A03/MF A01

The energy extraction efficiency as a function of input intensity was determined from a large-volume HF amplifier. For an input intensity of 4 x 10(6)W/cm(2), 1080 Joules was extracted from the amplifier. This corrresponded to an energy extraction efficiency of 0.90. At the highest H2/F2/02 pressures used, 1700 Joules was obtained from this system when used in an oscillator configuration. These results also show evidence that energy extraction at low input intensities in large-volume HF amplifiers is strongly influenced by parasitic oscillations. The results also indicate that, for a long-pulse HF amplifier (60-nsec electron beam), the timing between th amplifier and oscillator to achieve optimum operating conditions is not very critical. This same amplifier, used in conjunction with a short-pulse, good-beam-quality oscillator-preamplifier chain, has also been used to evaluate pulse compression using angular multiplexing. Using two sequential 24-nsec pulses, the essential elements of angulr multiplexing were evaluated as a function of interpulse separation time. DOE

N82-12920# Pennsylvania Univ., Philadelphia.
VERY-HIGH-ENERGY NUCLEAR PHYSICS Progress Report, 1 Jul. 1980 - 30 Jun. 1981
Sherman Frankel 14 Jul. 1981 9 p
(Contracts DE-AS02-78ER-04660; DE-AC02-78ER-04660)
(DE81-030025; DOE/ER-04660/1) Avail: NTIS HC A02/MF A01

High momentum phenomena in nuclei and ultrarelativistic nuclear-nuclear collisions are addressed. Experiments concerning measurement and backward production using polarized protons are reported. Direct measurement of the properties of the hadronization of excited nucleons is discussed. High multiplicity, in a region around a rapidity of y = 0, resulting from a head-on alpha-alpha collision in which four nucleons in each alpha have interacted, is reported. The frequency of multiple scatters in both p-alpha and alpha-alpha collisons is also reported. Five projects in progress are included. N.W.

N82-12921# Los Alamos Scientific Lab., N. Mex.
SPACE NUCLEAR SAFETY AND FUELS PROGRAM Progress Report
S. E. Bronisz, comp. Jul. 1981 14 p refs
(Contract W-7405-eng-36)
Avail: NTIS HC A02/MF A01

The use of (238) PuC2 in radioisotope power systems are discussed. Impact testing, module handling procedures, and nondestructive test data for encapsulated pellets are reported. DOE

N82-12922# Pacific Northwest Lab., Richland, Wash.
SURVEY OF MATRIX MATERIALS FOR SOLIDIFIED RADIOACTIVE HIGH-LEVEL WASTE
W. E. Gurwell Sep. 1981 58 p refs
(Contract DE-AC06-76RL-01830)
(DE82-000708; PNL-3512) Avail: NTIS HC A04/MF A01

Practical matrix materials for future develoment that most enhance the stability of the matrix waste forms were investigated. The functions of the matrix were reviewed. Desirable matrix material properties were discussed and listed relative to the matrix functions. Potential matrix materials were discussed and recommendations were made for future matrix development. The matrix mechanically contains waste cores, reduces waste form temperatures, and is capable of providing a high quality barrier to leach waters. High r matrices that separate and individually encapsulate the waste cores are fabricated by powder

fabrication methods, such as sintering, hot pressing, and hot isostatic pressing. Three material classes potential satisfy the requirements for a barrier matrix and are recommended for development: titanium, glass, and graphite. Polymers appear to be marginally adequate, and a more thorough engineering assessment of their potential should be made. DOE

N82-12923# Oak Ridge National Lab., Tenn. Engineering Physics Div.

ORELA ELECTRON GUNS

O. W. Christian and T. A. Lewis Sep. 1981 29 p refs
(Contract W-7405-eng-26)
(DE81-030703; ORNL/TM-7886) Avail: NTIS HC A03/MF A01

Procedures for gun production described include gun shell construction, anode and grid focus electrode, emitter preparation, and electrophoretic coating, and cathode heater assembly and support. The conversion of carbonates to oxide and cathode activation is also discussed as well as high voltage conditioning of the gun. Highlights of the performance characteristics are included. DOE

N82-12924# Oak Ridge National Lab., Tenn.

LOW-LEVEL RADIOACTIVE WASTE: AN INTRODUCTORY OVERVIEW

H. W. Godbee and A. H. Kibbey 1981 9 p Presented at the ASME Short Course on Radioactive Waste Management for Nucl. Power Reactors and Other Facilities, Alexandria, Va., 13-17 July, 1981
(Contract W-7405-eng-26)
(DE81-026334; CONF-810733-1) Avail: NTIS HC A02/MF A01

In 1980, the accumulated volume of buried low-level waste (LLW) in the United States amounted to over 92,000 cu m. Of this, 49,700 cu m was attributed to the US commercial fuel cycle, 36,400 cu m to institutional and industrial, and 76,300 cu m to government activities. In addition, there was another 6500 cu m of LLW sent to commercial burial grounds from government agencies or other licensed activities (e.g., fabrication of fuel for foreign reactors). If no more land is licensed for commercial burial, Barnwell with its limited waste acceptance will be the only site still operating in the year 2000. Of the DOE sites, only NTS and Hanford will have ample land. All the other principal DOE sites except LASL will be exhausted and this site will have about 7 of usable land left. DOE

N82-12925# Battelle Pacific Northwest Labs., Richland, Wash.

PROCESS FOR THE DENITRIFICATION OF HIGH-LEVEL RADIOACTIVE LIQUID WASTES

F. J. Gattys 10 Jul. 1981 17 p refs Transl. into ENGLISH of German patent 2,807,324 (21 Feb. 1978)
(DE81-026875; PNL-TR-415) Avail: NTIS HC A02/MF A01

Commercial paraformaldehyde with a low water content and mean particle size smaller than 60 microns is introduced as denitrifying agent at about 110 C into the liquid waste. A buffer of citric acid and phosphate is added during the denitrification reaction. The escaping gases contain nitrogen oxides which are recombined and concentrated to about 40 percent by weight nitric acid. DOE

N82-12926# Rockwell International Corp., Golden, Colo. Energy Systems Group.

NUCLEAR WASTE INCINERATION TECHNOLOGY STATUS

D. L. Ziegler, G. D. Lehmkuhl, and L. J. Meile 15 Jul. 1981 123 p refs
(Contract DE-AC04-76DP-03533)
(DE81-025751; RFP-3250) Avail: NTIS HC A06/MF A01

The incinerators developed and used for radioactive waste combustion are discussed and suggestions are made for uses of incineration in radioactive waste management programs and for incinerators best suited for specific applications. Information on the amounts and types of radioactive wastes are included to indicate the scope of combustible wastes being generated and in existence. Operating information on US and foreign incinerators is also included. Development needs are identified for extending incinerator applications and for establishing commercial acceptance. DOE

N82-12927# California Univ., Berkeley. Lawrence Berkeley Lab.

MONITOR FOR DETECTING NUCLEAR WASTE LEAKAGE IN A SUBSURFACE REPOSITORY

S. Klainer, T. Hirschfeld, H. Bowman, F. Milanovich, D. Perry, and D. Johnson 5 Nov. 1980 89 p refs
(Contract W-7405-eng-48)
(DE81-026429; LBL-11981) Avail: NTIS HC A05/MF A01

A remote fiber optics system is employed in conjunction with the coprecipitation enhanced fluorimetry technique to detect radioactive waste leakage. An in situ monitoring capability using fiber optics to effect communication between the instrumentation and the sample is demonstrated. The sample is an actinide or a tracer material leaking from an underground nuclear waste repository into the ground water. A lanthanide (which is an excellent fluorescent agent), actinide or other species which does not radiation damage is chosen as the tracer to maximize sensitivity, specificity, and relevance. Taggants having variable excitatio and emission wavelengths create a need for an acromatic retroreflective fiber coupler. This was done using the geometrical properties of the fiber to design a coupler requiring no dichroics or glossy energy splitting surfaces. DOE

N82-12928# Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik und Energiesysteme.

CALCULATION OF TRANSIENT AND QUASI-STATIONARY FLOWS IN HIGH TEMPERATURE REACTORS WITH SPHERICAL NUCLEAR FUEL ELEMENTS, USING THE VORTEX FLOW METHOD Ph.D. Thesis [ZUR ANWENDUNG DER WIRBELSTROMMETHODE FUER DIE TRANSIENTE UND QUASISTATIONAERE STROEMUNGSBERECHNUNG IN HOCHTEMPERATURREAKTOREN MIT KUGELFOERMIGEN BRENNELEMENTEN]

Immanuel Hoefer Dec. 1980 183 p refs In GERMAN
(IKE-4-98) Avail: NTIS HC A09/MF A01

The equations of the vortex flow method were derived in their primitive form for inhomogeneous regions in order to calculate the flows and the temperature behavior in high temperature nuclear reactors, aiming at a further development of the computerized simulation of these reactors. By modifying the flow function in parallel channels in the reflector region, a parallel flow is simulated. The flow in regions with low pressure losses are approximated by a potential flow. After comparing a number of explicit and implicit difference methods to solve numerically the time dependent convective part of the equations, the method UPWIND differences was chosen as an interpolation procedure. Examples show the applicability of this calculation method for spherical nuclear fuel elements with forced and natural convection. Author (ESA)

74 OPTICS

Includes light phenomena.

N82-12929 California Inst. of Tech., Pasadena.

OPTOGALVANIC SPECTROSCOPY AND CATAPHORETIC LASER ISOTOPE SEPARATION Ph.D. Thesis

Andrew Keith Gabriel 1981 313 p
Avail: Univ. Microfilms Order No. 8121059

A microscopic theory for the positive column discharge (PCD) was developed using rate equations and power balance equations to model the microscopic discharge processes. Macroscopic variables were calculated from the microscopic parameters. The model is used to characterize a hydrogen-helium PCD. The equations in the model are modified to account for the presence of resonant (H-alpha) radiation from an external source. The model is then used to predict the voltage change in a hydrogen PCD (the optogalvanic effect) as a function of current, illumination intensity, and gas pressure. The results compare very favorably with experiments conducted to measure the OGE. Dissert. Abstr.

N82-12930*# Stanford Univ., Calif. Dept. of Electrical Engineering.

RADIOGRAPHIC APPLICATIONS OF SPATIAL FREQUENCY MULTIPLEXING Final Report, Jun. 1978 - Dec. 1980

Albert Macovski Jul. 1981 13 p

(Contract NAS5-25043)
(NASA-CR-166748) Avail: NTIS HC A02/MF A01 CSCL 20F

The application of spacial frequency encoding techniques which allow different regions of the X-ray spectrum to be encoded on conventional radiographs was studied. Clinical considerations were reviewed, as were experimental studies involving the encoding and decoding of X-ray images at different energies and the subsequent processing of the data to produce images of specific materials in the body. R.J.F.

N82-12931*# Perkin-Elmer Corp., Danbury, Conn. Optical Technology Div.
STUDY OF HOLLOW CORNER RETROREFLECTORS FOR USE IN A SYNCHRONOUS ORBIT Final Report, Sep. 1974 - Feb. 1975
P. R. Yoder, Jr. Mar. 1975 119 p refs
(Contract NAS5-20580)
(NASA-CR-166750; ER-275) Avail: NTIS HC A06/MF A01 CSCL 20F

The performance of a hollow corner cube retroreflector made up of three mutually perpendicular optically flat mirrors when undergoing the thermal-mechanical strains induced by a spacecraft environment was studied. Of particular interest was a device of 200 square centimeter optical aperture used on a satellite in a synchronous orbit. It was assumed that the reflector always faces the earth. The effects of direct solar irradiance, earthshine, and albedo were considered. The results included the maximum mirror surface temperature during the orbit as well as the worst-case loss of optical performance due to thermally-induced mirror distortions. It was concluded that a device made of three suitably coated flat ULE mirrors, optically contacted to each other and supported mechanically in a nonrigid mount, would be expected to concentrate over 80 percent of the theoretical maximum energy in the central of the far field diffraction pattern. Continued development of the device through a detailed design, fabrication, and test phase was recommended. R.J.F.

N82-12932# Cincinnati Univ., Ohio. Solid State Electronics Lab.
INTEGRATION OF A DETECTOR ARRAY WITH AN OPTICAL WAVEGUIDE STRUCTURE AND APPLICATIONS TO SIGNAL PROCESSING Final Report, 15 Jun. 1976 - 14 Mar. 1981
J. T. Boyd, D. A. Ramey, C. L. Chen, A. Naumaan, and S. Dutta 7 Aug. 1981 73 p refs
(Grant AF-AFOSR-3032-81; AF Proj. 2305)
(AD-A105067; AFOSR-81-0695TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

Both planar thin film and channel optical waveguides have been integrated with charge-coupled devices (CCDs). Coupling of light from the waveguide region to the detector elements utilizes a smooth and uniformly-tapered region of SiO2 to minimize scattering. CCd transfer inefficiency of 1.0 times ten to the minus fourth power is consistently obtained for a number of devices. A channel waveguide array formed in a fan-out pattern is introduced as a means of enhancing focal plane resolution in integrated optical devices using optical waveguide lenses. High spatial resolution can thus be obtained without making detector spacings too small, thus avoiding detector problems with regard to fabrication, crosstalk, linearity, and charge transfer inefficiency. Operation of an integrated optical channel waveguide array-CCD transversal filter is reported. Channel waveguides formed in V-grooves couple directly to the sensor elements of the four phase, double polysilicon CCD. Experimental results include a filter transfer function having good agreement with theoretical results. The voltage contrast mode of a scanning electron microscope (SEM) is utilized to observe charge-coupled devices (CCDs) which have been cross sectioned. A new cross sectioning technique which uses anisotropic etching to accurately define the axis along which fracture occurs is presented. GRA

N82-12933# ARO, Inc., Arnold Air Force Station, Tenn.
INFRARED REFLECTANCE AND REFRACTIVE INDEX MEASUREMENTS IN VACUUM-RATED HEMIELLIPSOIDAL MIRROR REFLECTOMETER FROM 20 TO 300 DEG K Interim Report, 1 Feb. 1977 - 1 Mar. 1979
B. E. Wood and A. M. Smith Sep. 1981 37 p refs
(AD-A105113; AEDC-TR-81-21) Avail: NTIS HC A03/MF A01 CSCL 20/6

Experimental studies have been carried out for determining the change in reflectance caused by the condensation of thin films on 77 and 20 deg. K mirror surfaces in the 20 to 25 microns wavelength range. Refractive indices of the gases condensed were measured at the He-Ne laser wavelength, 0.6328 microns. Hemispherical-directional reflectance measurements of the mirror-condensed gas composites were made using a hemiellipsoidal mirror reflectometer system. The refractive index and reflectance of condensed films of N2, O2, CO2, H2O, NH3, N2O, NO, CO, CH4, argon, air, and allene were measured. Thicknesses and refractive indices were determined using the two-angle interference technique. In addition to the reflectance measurements made on cryogenic samples, an interfacility comparison of relfectance measurements was made on several anodized metal coatings at room temperature using reflectometers at the Air Force Materials Laboratory at Wright-Patterson Air Force Base, the Convair Division of General Dynamics Corporation in San Diego, and at AEDC. Reflectance measurements were also made on a variety of salt samples (such as nitrates, sulfates, and chlorides) at room temeprature and at 77 K to demonstrate the applications available for the HEMR. Author (GRA)

N82-12934# Mississippi State Univ., Mississippi State. Dept. of Physics.
THE UNIQUENESS OF PHASE RETRIEVAL FROM INTENSITY MEASUREMENTS Final Report, 1 Apr. 1980 - 31 Mar. 1981
John T. Foley Aug. 1981 57 p refs
(Grant AF-AFOSR-0162-80; AF Proj. 2301)
(AD-A105168; AFOSR-81-0679TR) Avail: NTIS HC A01/MF A01 CSCL 20/6

Several aspects of the question of the determination of the phase of a wavefield from the knowledge of its intensity in the aperture plane and focal plane of a thin lens are investigated. The role of diffraction from the lens aperture is studied. It is shown that for an astigmatic Gaussian beam this method of phase retrieval is highly nonunique if the beamwidth in the aperture plane is much smaller than the radius of the aperture. For several test cases, it is shown that if the beamwidth is not small compared to the radius of the aperture the above-mentioned nonuniqueness is removed (except for the well-known twin solution ambiguity). The twin solution is discussed and a method for eliminating it is proposed. Author (GRA)

N82-12935# Rochester Univ., N. Y. Inst. of Optics.
X-RAY OPTICS Final Scientific Report, 1 Feb. 1979 - 31 Mar. 1981
Nicholas George 11 Jul. 1981 35 p
(Grant AF-AFOSR-3563-78; AF Proj. 2306)
(AD-A105220; AFOSR-81-0684TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

This final scientific report covers research activities on X-Ray Optics. The report description is contained in the following sections: Preliminary Study of Source Coherency; Lloyd's Mirror Experiment; X-Ray Speckle; Measurement of Film Resolution; Experiments of 20 - 22 May 1980; Experiments of 8 September 1980; Conclusions and Plans. GRA

N82-12936# Hughes Research Labs., Malibu, Calif.
ANISOTROPIC AND ELECTRO-OPTICAL EFFECTS IN LIQUID CRYSTALS Final Report, 1 Oct. 1976 - 30 Nov. 1980
J. David Margerum Aug. 1981 193 p refs
(Contract F49620-77-C-0017; AF Proj. 2303)
(AD-A105189; AFOSR-81-0690TR) Avail: NTIS HC A09/MF A01 CSCL 20/6

The objective of this program was to study the effects of the chemical structure of liquid crystal components on the anisotropic properties of nematic mixtures, especially in regard to their electro-optical response characteristics. The program was particularly aimed at obtaining a better understanding of the effects of components on the DS mode. A similar, secondary goal was to study the effects of structure on the VGM in some of the same nematic mixtures. We chose to study ester LCs in this program because of our prior experience with phenyl benzoate LCs and dopants for DS effects. The phenyl benzoate ester

mixtures are of particular interest for DS because they are colorless and relatively stable to moisture, they can be formulated to have a negative dielectric anisotropy, they can be adequately purified for controlled doping, and they show good dc stability when used with redox dopants. In this program we have examined the properties and effects of many different types of ester LC components, including cyclohexanecarboxylates, biphenylcarboxylates, benzoylaoxybenzoates, acyloxybenzoates, and thiobenzoates, as well as various benzoate structures. GRA

N82-12937# Oak Ridge Y-12 Plant, Tenn. Fabrication Systems Dept.

PRODUCTION INTERFEROMETRIC TESTING OF DIAMOND-TURNED SURFACES

R. E. Sladky Sep. 1981 30 p refs

(Contract W-7405-eng-26)

(DE82-000172; Y-2208) Avail: NTIS HC A03/MF A01

Some of the optical interferometric tests that are used to examine the figure of diamond-turned optics are described. Some tests are routine, and the results can be statistically examined to measure the repeatability of the testing process. Interferograms are analyzed to obtain the rms or peak-to-valley errors and optical aberrations. From these data, the repeatability of the interferometric procedure is obtained. Tests show that a single interferogram can be digitized repeatedly with excellent precision, but a series of interrerograms is affected by changing environmental conditions. Precision measurements of a plated mirror over a period of time are affected by variations in the temperatures of the mirror. DOE

N82-12938# MITEC G.m.b.H., Ottobrunn (West Germany).

DEVELOPMENT OF A SMALL OPTO-ELECTRONIC DISTANCE MEASURING DEVICE Final Report

Hans Jochen Koellner Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 19 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-168; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4

A miniaturized opto-electronic distance measuring device, suitable for mass production and capable of covering a variety of applications, was developed. The principle of time of flight measurement of light pulses is used. The basis of this development is a method of defining the beginning and the end of a time measurement. A prototype meeting the required technical specifications as to distance measuring range, distance and angle resolution, measuring frequency and averaging is presented. After running through a preparation phase it can be produced in large quantities in a relatively inexpensive way. Major application fields will be automation and general distance measurements. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-12939# Nagoya Univ. (Japan). Dept. of Engineering.

DISRUPTION OF HIGH BETA PLASMA INDUCED BY RESISTIVE DRIFT MODE

Shinji Hiroe, Toshiju Kunibe, and Hidenori Akiyama Sep. 1981 37 p refs

(IPPJ-538) Avail: NTIS HC A03/MF A01

The observation of a disruptive instability when a high density cold plasma is injected into the ASMIC-I symmetric mirror is reported. The azimuthal mode number of the disruption is m = 0. When the plasma disrupts, it escapes both across and along the magnetic field lines. This disruption is observed only when the resistive drift instability grows near the surface of the plasma. The disruption can be suppressed when the resistive mode is stabilized. T.M.

N82-12940# Institute of Physical and Chemical Research, Saitama (Japan).

ECR DISCHARGE CLEANING EXPERIMENT IN THE JIPP T-11

Y. Sakamoto, Y. Ishibe, S. Ishii, K. Okazaki, H. Oyama, K. Yano, N. Noda (Nagoya Univ., Japan), K. Kawahata (Nagoya Univ., Japan), Y. Kawasumi (Nagoya Univ., Japan), and S. Tanahashi (Nagoya Univ., Japan) Nagoya, Japan Nagoya Univ. Sep. 1981 22 p refs

(IPPJ-539) Avail: NTIS HC A02/MF A01

The JIPP T-2 torus device was used to find the effect of the cleaning on Tokamak discharges. To characterize the Tokamak discharge property, mean plasma resistivity, intensity of an oxygen ions spectral line and mean electron density without gas puffing were measured. The first cleaning operation for 5 hrs drastically improved the purity of the Tokamak discharge plasma. The succeeding 75 hrs cleaning gave the wall surface condition corresponding to Z(eff) = 1.5. The cleaning plasma had the electron temperature of 5 eV and density of about 10 billion cu cm with a hydrogen pressure of 0.029 Pa and a microwave power of 800 W. A.R.H.

N82-12941# Yokohama National Univ. (Japan). Research Inst. for Energy Materials.

INTERACTION OF ION-ACOUSTIC SOLITIONS IN MULTI-DIMENSIONAL SPACE, 2

Fujio Kako and Nobuo Yajima (Kyushu Univ.) Nagoya, Japan Nagoya Univ. Aug. 1981 39 p refs

(IPPJ-535) Avail: NTIS HC A03/MF A01

Numerical computations are made to study the collision process between two cylindrical or spherical solitons. The soliton resonance is found to play an important role in collision process between two curved solitons as well as between two plane solitons. Author

N82-12942# Nagoya Univ. (Japan). Inst. of Plasma Physics.

STABILIZATION OF RAYLEIGH-TAYLOR INSTABILITY DUE TO THE SPONTANEOUS MAGNETIC FIELD IN LASER PRODUCED PLASMA

Masatada Ogasawara and Masami Takita (Keio Univ. Yokohama, Japan) Sep. 1981 17 p refs

(IPPJ-537) Avail: NTIS HC A02/MF A01

Spontaneous magnetic fields due to the temperature gradient VT0 produced by a focused laser beam on one point of a pellet are taken into account in deriving the dispersion relation of Rayleigh-Taylor instability. Growth rate (gamma) decreases with time. Density fluctuation with wavelength shorter than 1.5 (R/L sub T) x (n sub s/n sub 0) to the 1/2 power micrometer is remarkably stabilized, where R, L sub T, n sub s and n sub 0 are the radius of a pellet, L sub T/1 = (VT sub 0/T sub 0), number densities of solid and the pellet. Validity condition of the theory is gamma to sub 0 >> 1 or in another form R >> L, where t sub 0 is the time of thermal expansion of a pellet and L/1 = Vn sub 0/n sub 0. Author

N82-12943*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

END REGION AND CURRENT CONSOLIDATION EFFECTS UPON THE PERFORMANCE OF AN MHD CHANNEL FOR THE ETF CONCEPTUAL DESIGN

S. Y. Wang and J. Marlin Smith [1981] 9 p refs To be presented at the 20th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA

(Contract DE-AI01-77ET-10769)

(NASA-TM-82744; DOE/NASA/10769-22; E-1057) Avail: NTIS HC A02/MF A01 CSCL 20I

The effects of MHD channel end regions on the overall power generation were considered. The peak plant thermodynamic efficiency was found to be slightly lower than for the active region (41%). The channel operating point for the peak efficiency was shifted to the supersonic mode (Mach No., M sub c approx. 1.1) rather than the previous subsonic operation (M sub c approx. 0.9). The sensitivity of the channel performance to the B-field, diffuser recovery coefficient, channel load parameter, Mach number, and combustor pressure is also discussed. In addition, methods for operating the channel in a constant-current mode are investigated. This mode is highly desirable from the standpoint of simplifying the current and voltage consolidation for the inverter system. This simplification could result in significant savings in the cost of the equipment. The initial results indicate that this

simplification is possible, even under a strict Hall field constraint, with resonable plant thermodynamic efficiency (40.5%). N.W.

N82-12944# Boston Gas Co., Mass. Dept. of Physics.
STRONGLY COUPLED PLASMA RESEARCH FOR THE EQUATION OF STATE AND CONDUCTIVITY OF A LASER-COMPRESSED ELECTRON-ION PLASMA Final Report, 1 Jan. 1976 - 31 Dec. 1980
G. Kalman, K. I. Golden (Northeastern Univ.), and P. Bakshi 15 Aug. 1981 15 p refs
(Grant AF-AFOSR-2960-76; AF Proj. 2301)
(AD-A105195; AFOSR-81-0674TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

A novel scheme for the analysis of dense, strongly coupled plasmas, occurring in laser compression (and other) experiments, has been developed. The scheme has been applied to the analysis both of static and of dynamic properties of such plasmas. Comparison with conventional perturbative weak coupling theories and with other strong coupling schemes have been performed: they confirm the superiority of the present scheme.
Author (GRA)

N82-12945# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
PHYSICS OF HIGH TEMPERATURE, DENSE PLASMAS Interim Report, 1 Jan. 1980 - 31 Mar. 1981
D. M. Woodall Mar. 1981 66 p refs
(Grant AF-AFOSR-0060-79; AF Proj. 2301)
(AD-A105169; NE-91(81)AFOSR-765-2; AFOSR-81-0687TR)
Avail: NTIS HC A03/MF A01 CSCL 20/9

The grant, 'The Physics of High Temperature, Dense Plasmas,' includes work on two projects in conjunction with the Advanced Concepts Branch of the Applied Physics Division at the Air Force Weapons Laboratory. The first is a relativistic electron beam-(REB) heated, dense plasma experiment using REB facilities at AFWL, and the second is soft X-ray instrumentation work pertinent to the SHIVA X-ray simulation facility. This report primarily details work in progress and results achieved in the REB-Plasma interaction experiments, since much of our effort during the period of this report have been directed at that project. GRA

N82-12946# Naval Research Lab., Washington, D. C. Space Science Div.
THRESHOLD CRITERIA FOR A SPACE SIMULATION BEAM-PLASMA-DISCHARGE Interim Report
E. P. Szuszczewicz, K. Papadopoulos (Science Applications, Inc., McLean, Va.), W. Bernstein (Rice Univ.), C. S. Lin (Bendix Field Engineering Corp., Columbia, Md.), and D. N. Walker 23 Sep. 1981 29 p refs
(RR0330244)
(AD-A104937; NRL-MR-4608) Avail: NTIS HC A03/MF A01 CSCL 20/9

We have conducted an experimental and theoretical study of the threshold characteristics of a space-simulation beam-plasma-discharge (BPD) with emphasis on density profiles and density-dependent ignition criteria. The study included various beam-plasma conditions covering beam currents from 8 to 85 ma, beam energies from 0.8 to 2.0 ke V and magnetic fields at 0.9 and 1.5 gauss. The study included experimental determinations of radial profiles of electron density for each of the selected conditions extending from a low-density per-BPD state to a strong BPD condition. At BPD threshold it was determined that 3.9 < or = omega p/omega c < or = 5.8 was the density-dependent ignition criterion. The experimental results are shown to agree with detailed model calculations which consider the BPD to be produced by large amplitude electron plasma waves resulting from the beam-plasma interaction. Author (GRA)

N82-12947# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
NOVEL LIMITER PUMP TOPOLOGIES
Joel E. Schultz 1981 33 p refs
(Contract DE-AC02-78ET-51013)
(DE81-030029; DOE/ET-51013/6) Avail: NTIS HC A03/MF A01

The use of limiter pumps as the principle plasma exhaust system of a magnetic confinment fusion device promises significant simplification, when compared to previous investigation of divertor based systems. Further simplifications, such as the integration of the exhaust system with a radio frequency heating system and with the main reactor shield and structure are investigated. The integrity of limiters in a reactor environment is threatened by many mechanisms, the most severe of which may be erosion by sputtering. Two novel topologies are suggested which allow high erosion without limiter failure. DOE

N82-12948# Association Euratom-CEA, Fontenay-aux-Roses (France). Dept. de Recherches sur la Fusion Controlee.
ELECTRON CYCLOTRON DAMPING FOR LARGE WAVE AMPLITUDE IN TOKAMAK PLASMAS
I. Fidone, G. Granata, and R. L. Meyer (Nancy Univ.) May 1980 36 p refs
(EUR-CEA-FC-1053) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The quasilinear kinetic equation to study cyclotron wave absorption in Tokamak plasmas is derived and investigated. A simplified form of the steady-state equation is also obtained and used to discuss the nonlinear damping of the ordinary mode in a hot plasma. The amplitude dependent damping is numerically evaluated for wave powers of practical interest. It is also shown that, for wave propagation from the high magnetic side of the Tokamak, electron cyclotron wave absorption results in the creation of fast tail electrons. DOE

N82-12949# Oak Ridge National Lab., Tenn. Computer Sciences Div.
COMPARISON OF RESULTS BETWEEN THE BALLOONING MODES CODES BLOON AND BALOON
J. K. Munro, Jr. Aug. 1981 35 p refs
(Contract W-7405-eng-26)
(DE81-030259; ORNL/CSD/TM-157) Avail: NTIS HC A03/MF A01

Ballooning mode equation eigenvalues calculated by two different codes, BLOON and BALOON were compared for a sequence of equilibria having a range of beta values. The results agree for marginal stability only. Differences away from marginal stability may be due to differences in the coordinate systems used for the analysis in the two codes. Equilibria were generated using the ISLAND code. Results of various convergence studies made with the codes are presented together with recommendations for their use. DOE

N82-12950# Wisconsin Univ., Madison.
HIGH-MODE-NUMBER MHD STABILITY OF A TOROIDAL MULTIPOLE
M. W. Phillips Sep. 1981 25 p refs
(Contract DE-AS02-76ET-53051)
(DE81-030484; DOE/ET-53051/26) Avail: NTIS HC A02/MF A01

The stability of an axisymmetric plasma with no toroidal magnetic field is studied using a high toroidal mode number expansion of the MHD energy principle. A partial differential eigenvalue equation governing electromagnetic modes is derived. This equation is solved using a perturbation expansion with the inverse toroidal mode number as the smallness parameter resulting in two ordinary differential equations one determining the structure of the mode parallel to magnetic field lines and the other determining structure perpendicular to field lines. The equations are solved numerically for the levitated octapole and stability criteria are given. DOE

N82-12951# Flinders Univ., Bedford Park (Australia). School of Physical Sciences.
EFFECTS OF PREIONIZATION LEVEL ON A STABILIZED Z-PINCH
C. Silawatshananai, F. S. B. Anderson, M. H. Brennan, G. Durance, I. R. Jones, E. L. Murray, and J. Tendys Feb. 1980 54 p refs
(FUPH-R-164) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The influence of the degree of preionization on the formation and properties of a conventional 'stabilized' Z-pinch was studied experimentally for preionization levels ranging from 2 percent to 35 percent. It is concluded that the possibility exists of using varying levels of preionization to tailor radial profiles of density

and pressure, and hence to influence the value of (ALPHA) sub (theta). DOE

N82-12952# California Univ., Livermore. Lawrence Livermore Lab.
USING SPECTRAL LINE PROFILES AS A DIAGNOSTIC OF THE PLASMA ELECTRON DENSITY
R. W. Lee and D. L. Matthews Aug. 1981 22 p
(Contract W-7405-eng-48)
(DE81-030313; UCID-19173) Avail: NTIS HC A02/MF A01

A simple interactive fitting procedure is given which uses line profiles calculated for highly stripped ions, i.e., hydrogenic, helium-like and lithium-like species. The calculation of these profiles is provided. DOE

N82-12953# Oak Ridge National Lab., Tenn.
SIMPLE-POWER-BALANCE MODEL FOR MICROWAVE HEATING IN EBT
D. B. Batchelor Aug. 1981 65 p refs
(Contract W-7405-eng-26)
(DE81-030428; ORNL/TM-7001) Avail: NTIS HC A04/MF A01

A simple model is presented for the production and absorption of ordinary and extraordinary mode energy in various regions of the ELMO bumpy torus plasma. The plasma is divided into two regions: (1) the low magnetic field side of the extraordinary mode cutoff and (2) the high field side of the cutoff. Energy balance equations are written for the sources (injection, mode conversion, and tunneling) and sinks (mode conversion, absorption, and tunneling) in each region, and simplified models are introduced to account for each of these processes. Since a typical ray makes several reflections from cavity wall surfaces before being absorbed, additional simplifying assumptions are made that the wave fields are an isotropic incoherent superposition of plane waves and that the energy density of each mode is uniform in a given region. DOE

N82-12954# Los Alamos Scientific Lab., N. Mex.
INERTIAL FUSION PROGRAM Program Dates, 1 Jun. - 30 Jun. 1979
F. Skoberne, comp. Jun. 1981 196 p refs
(Contract W-7405-eng-36)
(DE81-030512; LA-8114-PR) Avail: NTIS HC A09/MF A01

Progress in the development of high-energy short-pulse carbon dioxide laser systems for fusion research is reported. Improvements for the Gemini System and the eight-beam system Helios are summarized and the 100- to 200-TW Antares target irradiation system is discussed. Other topics covered include: (1) phase conjugation by degenerate four-wave mixing and its applicability to laser fusion system; (2) frequency multiplexing as a means toward multipulse energy extraction; (3) experiments with targets designed accurate diagnostics; (4) the detection of expanding ions, neutron yield, and X-ray emission; (5) target design codes for use with the CRAY-1 computer; (6) implosion phenomena; (7) the development of a ICF reactor blanket that offers a promising alternative to the usual lithium blanket; and (8) the formulation of capital-cost data base for laser fusion reactors. DOE

N82-12955# Australian National Univ., Canberra. Inst. of Advanced Studies.
PLASMA RESEARCH LABORATORY REPORT, 1979 Annual Report
1980 19 p refs
(INIS-mf-6087) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository libraries

Research activities outlined include upgrading of the Tokamak, studies of toroidal magnetic fields aimed at optimizing the field configuration on stellarators and a design study on a proposed large modular stellarator. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-12956 Cornell Univ., Ithaca, N. Y.
SELECTED AREA GROWTH FOR DIGITAL INTEGRATED CIRCUITS AND ATOMIC PLANE DOPING OF GALLIUM ARSENIDE BY MOLECULAR BEAM EPITAXY Ph.D. Thesis
George Martin Metze 1981 244 p
Avail: Univ. Microfilms Order No. 8119457

Molecular beam epitaxy, because of its low growth rate and control (i.e., modulation) over numerous molecular beams, provides tremendous accuracy and flexibility in growing the most complex structures. Lamella doping is used to tailor doping profiles within an active region to nearly any concentration gradient and profile required. The technique doping requires the momentary suspension of growth, during which a predetermined amount of dopant (lamella) is deposited on the surface of the grown layer. Growth is then resumed and the process repeated with subsequent lamella concentrations altered to provide correct doping profiles. Another potentially important technique involves the simultaneous deposition of single crystal and polycrystalline GaAs. This planar process of selective molecular beam epitaxy was used to define and isolate single crystal GaAs regions. Dissert. Abstr.

N82-12957 Cornell Univ., Ithaca, N. Y.
ELECTRON FIELD EMISSION TUNNELING SPECTROSCOPY OF PLATINUM GROUP AND TUNGSTEN METALS IN THE PRESENCE OF MOLECULAR GAS AND NOBLE METAL ADSORBATES Ph.D. Thesis
Robert Louis Billington, III 1981 182 p
Avail: Univ. Microfilms Order No. 8119476

Hydrogen, carbon monoxide, oxygen, nitrogen, nitric oxide, ammonia and hydrazine were adsorbed on several crystal faces of iridium. Gold and copper were adsorbed on iridium, rhodium and platinum and on the crystal faces of tungsten. On W(100) the surface state present in the clean FEED spectrum disappears immediately as adsorption of gold and copper begins. However, at both one and two monolayer coverages, the surface state and, in fact, the entire clean energy spectrum returns. For the platinum group metals, a large binding energy anisotropy between the Ir(111) plane and the emitter surface around it is found for both gold and copper. Either metal rapidly diffuses off the flat(111) plane at 600 K. The most common result obtained in the gas adsorption experiments is that the interesting d-band energy structure found on the clean iridium surface is removed, leaving a free-electron-like FEED spectrum. Complx phenomena observed for nitric oxide are described. Dissert. Abstr.

N82-12958 Tufts Univ., Boston, Mass.
A SYSTEMATIC STUDY OF THE EFFECTS OF 3d, 4f AND 5f IMPURITIES ON THE CRITICAL TEMPERATURE OF SUPERCONDUCTING Th; MEASUREMENTS TO 20 KILOBARS Ph.D. Thesis
John Bradley Bulman 1981 156 p
Avail: Univ. Microfilms Order No. 8121356

Superconducting transition temperature (Tc) measurements at pressures from zero to 20 kilobars are presented on alloy systems of various impurities from the iron group, rare earth and actinide series in thorium. The alloy systems studid are classified in terms of the effect of the impurity ions on Cooper pairs. The impurity system ThCr exhibits temperature dependent pair breaking and ThMn appears to also. The systems ThNd, ThSm, ThGd, ThDy, ThHo and ThEr show evidence of temperature independent pair breaking. Measurements on the ThPr and ThTb systems suggest a crystalline electric field modified pair breaking interaction, while the ThCe is a non-magnetic pair weakening system. The Actinide impurity system ThU too is a non-magnetic pair weakening system. Analysis of the initial rate of depression of Tc vs. impurity concentration supports an increasing degree of localization of the partially filled shells, progressing from the iron group to the actinides to the rare earths. Dissert. Abstr.

N82-12959 Iowa State Univ. of Science and Technology, Ames.
EFFECTS OF UNIAXIAL STRESS ON THE SCHOTTKY-BARRIER ELECTROREFLECTANCE SPECTRA OF GaAs AND GaP Ph.D. Thesis
Michael John Bohan 1981 102 p
Avail: Univ. Microfilms Order No. 8122502

Schottky barrier electroreflectance measurements were performed on samples of GaAs and GaP under uniaxial stress.

The E sub 0 structure of GaP and the E sub 2 structure of GaAs are investigated. Values are obtained for the linear contribution to the deformation potential of the E sub 0 peak of GaP. No stress induced splittings are resolved in the E sub 2 structure of GaAs due to the large value of the broadening parameter (200 mV). Empirical nonlocal pseudopotential calculations are used to locate two nearly degenerate critical points which may contribute to the E sub 2 structure. The predicted behavior of these critical points under uniaxial stress is calculated. Dissert. Abstr.

N82-12960 Arizona Univ., Tucson.
THE EXTINCTION BY SMALL ALUMINUM PARTICLES FROM THE FAR INFRARED TO THE VACUUM ULTRAVIOLET Ph.D. Thesis
Janice Elaine Rathmann 1981 79 p
Avail: Univ. Microfilms Order No. 8121922

Absorption measurements were performed from .12 micrometer to 250 micrometers on small particles of Al produced by the standard inert gas evaporation technique. These were done because experimental results of Granqvist et.al. revealed a discrepancy of over three orders of magnitude with the predictions of both the classical Drude theory for spherical particles and the quantum mechanical Gor'kov Eliashberg theory. The results of Granqvist et.al. in the far IR were confirmed and the data were extended to the UV. The anomalous absorption is explained with a model using the classical Drude theory by taking into account a distribution of ellipsoidal shapes and an amorphous oxide layer, which is found to cover the particles. In order to determine the optical constants of amorphous aluminum oxide required in the calculation, a technique applicable to powdered materials was used. The model developed with the shape distribution was found to give excellent agreement with the experimental results. Several models proposed by other authors to explain the anomalous far IR absorption were also considered, but did not agree as well with the data. Dissert. Abstr.

N82-12961 Washington Univ., St. Louis, Mo.
NUCLEAR MAGNETIC RESONANCE STUDIES OF SOLID KRYPTON Ph.D. Thesis
Eric Irvine Madaras 1981 229 p
Avail: Univ. Microfilms Order No. 8122748

A 1.55 MHz pulsed NMR experiment was performed on solid krypton samples containing 11.55% and enriched 73.1% Kr(83). The computer controlled experiment measured relaxation times T sub 1, T sub 2c, T sub 2q and T sub 1p; T sub 1 principally reflects quadrupolar Raman relaxation of the spin 9/2 Kr (83) by thermal phonons. The T sub 1p measured with an adiabatic demagnetization in the rotating frame (ADRF) at low H sub 1 field showed two relaxation times. One was associated with the partially resolved quadrupolar non-central transitions and labelled T sub 1pg(ADRF). The other time was associated with the-1/2 to 1/2 central transition and denoted by T sub 1pc(ADRF). The ratio of T sub 1 at high field to T sub 1pq(ADRF) at low field was 4 and is discussed in terms of relaxation by independent fluctuating quadrupolar interactions. All the various T sub 1p measurements indicated a thermally activated minimum associated with atomic diffusion near 95 K. These data, together with a corresponding temperature variation in T sub 2c provided a determination of self-diffusion in solid kryton. Dissert. Abstr.

N82-12962 Illinois Univ. at Chicago Circle, Chicago.
A STUDY OF THE PHASE TRANSITIONS IN BENZIL BY RAMAN AND BRILLOUIN SCATTERING TECHNIQUES Ph.D. Thesis
Douglas Raymond Moore 1981 163 p
Avail: Univ. Microfilms Order No. 8120570

The polarization Raman spectra exhibited by the external vibration modes of benzil were studied over the temperature range from 10 K to 300 K. Eight modes were observed above T sub c and the doubly degenerate E modes were seen to split into A and B components below T sub c. The lowest E mode exhibited considerable softening as the phase transition was approached from above and below and careful measurements near T sub c revealed a discontinuity in the Raman shift indicative of a first order transition. A series of Brillouin scattering measurements were performed on several oriented single crystals of benzil. At least squares analysis of the data led to the determination of the entire set of elastic constants at room temperature. A relatively small value of the elastic constant was found and its effect on the elastic properties of benzil is discussed. Dissert. Abstr.

N82-12963 State Univ. of New York at Binghamton.
IMPURITY RESISTANCE IN FERROMAGNETIC METALS Ph.D. Thesis
I-Min Jiang 1981 125 p
Avail: Univ. Microfilms Order No. 8120909

Two aspects of impurity resistance in ferromagnetic metals were investigated. First, the effect due to nonmagnetic impurities was investigated by considering the spin-dependent screened Coulomb potential as well as the different densities of states at the Fermi surface. It was found that the electrical resistivity increases monotonically with the increase of magnetization. This result is contrary to Neiminen's work which showed that electrical resistivity decreases when magnetization increases. Furthermore, The result also exhibited a significant difference from other results in which a resistivity minimum at low temperatures is predicted. Second, based on a dilute localized impurity spin model, the effect of magnetic impurities in a spin-polarized electron gas ated. A logarithmic divergent resistivity was found a low temperatures. This is qualitatively in agreement with the experiments. It is shown that the spin-dependent screened Coulomb potential is not able to interpret the anomalous resistivity minimum at low temperatures in ferromagnetic metals. However, magnetic impurities do contribute in a significant way to this anomaly. Dissert. Abstr.

N82-12964*# SEMTEC, Inc., Huntsville, Ala.
TRANSIENT AND DIFFUSION ANALYSIS OF Hg Cd Te Quarterly Progress Report, 20 Mar. - 20 Jun. 1980
J. C. Clayton 30 Jun. 1980 27 p refs
(Contract NAS8-33698)
(NASA-CR-161524) Avail: NTIS HC A03/MF A01 CSCL 20L

The solution of the one dimensional planar interface solidification problem is presented. Numerical solutions are applied to experimental solute profiles to determine the effective diffusion constant for Hg Co Te. Progress on the design and construction of a high gradient furnace is reported. S.L.

N82-12965*# Old Dominion Univ., Norfolk, Va. Dept. of Mathematical Sciences.
MODELING OF THIN-FILM GaAs GROWTH Progress Report, 15 May - 15 Sep. 1981
John H. Heinbockel Oct. 1981 42 p refs
(Grant NAG1-148)
(NASA-CR-164992) Avail: NTIS HC A03/MF A01 CSCL 20L

A solid Monte Carlo model is constructed for the simulation of crystal growth. The model assumes thermally accommodated adatoms impinge upon the surface during a delta time interval. The surface adatoms are assigned a random energy from a Boltzmann distribution, and this energy determines whether the adatoms evaporate, migrate, or remain stationary during the delta time interval. For each addition or migration of an adatom, potential wells are adjusted to reflect the absorption, migration, or desorption potential changes. Author

N82-12966# Florida Univ., Gainesville. Dept. of Electrical Engineering.
STUDY OF 1/f NOISE IN SOLIDS Progress Report, 1 Nov. 1979 - 31 May 1981
Karel M. VanVliet and Eugene R. Chenette May 1981 68 p refs
(Grant AF-AFOSR-0050-80; AF Proj. 2305)
(AD-A105219; AFOSR-81-0685TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

A Hewlett-Packard digital fast Fourier transform spectral analyser was purchased and adapted for our purpose by writing several computer programs for the output display. Test jigs for devices under test and preamplifiers were built. Further, a real time dual channel correlation spectral analyzer was designed and partially built. Measurements involving temperature fluctuations and correlations in metal films and in integrated circuit

transistors are described. The latter have been recently completed. It is conclusively shown that temperature fluctuations are not the cause of 1/f noise in these devices. Under the heading of theoretical work, an extensive analysis is presented of noise in diffusion systems. Several analytical models, not considered before, have been solved and the noise is presented. It is conclusively shown that volume (bulk) diffusion noise, whether based on the physical diffusion source or on Voss and Clarke's P-source, never leads to 1/f-type spectra. However, surface fluctuations as, e.g., caused by stochastic surface generation-recombination processes, can give rise to many decades of 1/f noise. This is worked out in detail for a MOSFET structure. We conclude, therefore, that the large noise observed in MOSFETs can be due to carrier number fluctuations subject to diffusion; at low frequencies the MacWhorter-van der Ziel model may be operative, whereas at higher frequencies our model takes over. Finally, in the theory section we present a novel derivation of quantum 1/f noise, occurring in emission processes. Author (GRA)

N82-12967# Georgia Inst. of Tech., Atlanta. Fracture and Fatigue Research Lab.

X-RAY SCATTERING INVESTIGATION OF MICROALLOYING AND DEFECT STRUCTURE IN ION IMPLANTED COPPER Progress Report

S. Spooner 26 Aug. 1981 17 p refs
(Contract N00014-78-C-0270)
(AD-A105442; GIT-E-19-664) Avail: NTIS HC A02/MF A01 CSCL 07/4

The double-crystal method for X-ray scattering analysis of radiation has been applied to the investigation of aluminum implanted copper. The interpretation of X-ray observations is based on effects of lattice strain in the surface microalloy and the presence of dislocation loops which originate from implantation damage. The copper crystal with a dislocation less than 1000 cm/cu cm was implanted with aluminum to a dose of 2 x 10 to the 16th power ions/cm with energies up to 200 keV. The response of the implanted crystal to annealing at 500 C and 600 C was determined. The quantitative use of the X-ray technique to assess implantation effects and the limitations of the technique are discussed. GRA

N82-12968# Georgia Univ., Athens.

SURFACE STRUCTURE AND GROWTH OF CRYSTALLINE MATERIALS Final Technical Report, 15 Nov. 1979 - 14 Nov. 1980

David P. Landua 14 Jul. 1981 7 p
(Grant AF-AFOSR-0053-80; AF Proj. 2301)
(AD-A105223; AFOSR-81-0621TR) Avail: NTIS HC A02/MF A01 CSCL 20/2

Computer simulation methods have been used to study spiral crystal growth from multiple dislocation edges. The results showed that after the spiral arms had all interacted once growth proceeded in agreement with the Burton-Cabrera-Frank continuum theory. For small Frank-Read dislocations the existence of a nucleation barrier was shown. Computer simulation studies of simple models of magnetic (binary alloy) lattices with exposed surfaces were also carried out. Surface order-disorder and order-order transitions were studied as a function coupling both below and above the bulk transition surface. GRA

N82-12969# Illinois Univ. at Urbana. Dept. of Metallurgy and Mining Engineering.

CHARACTERIZATION OF AS-GROWN DISLOCATION STRUCTURE IN NIOBIUM BY X-RAY DIFFRACTION TOPOGRAPHY

Stuart R. Stock, Haydn Chen, and Howard K. Birnbaum Sep. 1981 15 p refs
(Contract N00014-75-C-1012)
(AD-A105431) Avail: NTIS HC A02/MF A01 CSCL 07/4

The behavior of dislocations in b.c.c. metals has been extensively examined using relatively macroscopic methods, such as deformation studies and etch pitting, as well as with microscopic TEM methods. While these studies have led to significant increases in the understanding of dislocation behavior, the need remains for a method for studying the microscopic behavior of dislocations in relatively thick specimens. One such method, X-ray diffraction topography, has not been extensively applied due to the relatively high X-ray absorption of many of the metals of interest, such as niobium, and the consequent need to prepare highly perfect thin crystals. In the present note we report the preparation of such niobium crystals and the use of Lang topography to characterize their dislocation structures. Single crystal niobium specimens of thickness suitable for transmission topographic studies were grown by recrystallization of a heavily deformed polycrystalline ribbon of niobium. The procedure consisted of resistance heating at 2200 K and 2.6 times 10 to the minus 8th power Pa for times on the order of an hour. It should be noted, however, that due to outgassing of the niobium, protracted annealing was required to obtain this pressure. GRA

N82-12970# San Jose State Univ., Calif. School of Engineering.

DEEP LEVELS IN AL SUB X Ga SUB 1 XAs:Fe SINGLE CRYSTALS Interim Report

Rangaiya A. Rao 1 Mar. 1981 39 p refs
(Grant AF-AFOSR-0099-80; AF Proj. 2306)
(AD-A105233; TR-81-01; AFOSR-81-0696TR) Avail: NTIS HC A03/MF A01 CSCL 20/2

Deep levels are energy levels in the bandgap of a semiconductor with activation energies which are large compared to kT. At a deep defect, the carrier wavefunction is localized near the site of the defect and, hence, delocalized in k-space. The defect can couple to a variety of phonons and interacts strongly with the lattice. Deep states generally tend to be nonradiative centers. Physically, they could result from certain chemical impurities, native defects such as vacancies, complexes involving native defects and impurities, surfaces, and interfaces. A variety of deep centers are almost always present in semiconductor crystals. They may be introduced intentionally into a semiconductor crystal by various methods. Gold introduces a deep acceptor level and a deep donor level in silicon. Gold may be evaporated onto the surface of a silicon wafer and then diffused-in by heating the wafer at a temperature of the order of 900 C for several minutes so that the gold atoms distribute themselves uniformly in the silicon crystal. Impurities like chromium and iron may be added to the melt from which GaAs, Al sub x Ga(1 sub x)As, and other semiconductors are grown by liquid phase epitaxy. Heat treatment and bombardment by energetic electrons also create deep centers in semiconductors. Deep levels affect device performance in many ways. GRA

N82-12971# Stanford Univ., Calif. Lab. of Physics.

ELASTIC DOMAIN WALL WAVES IN FERROELECTRIC CERAMICS AND SINGLE CRYSTALS Annual Progress Report, 1 Feb. 1980 - 31 Jan. 1981

B. A. Auld Sep. 1981 26 p refs
(Contract N00014-79-C-0222)
(AD-A105110; GL-3314) Avail: NTIS HC A03/MF A01 CSCL 20/3

Experiments have been performed in ferroelectric ceramics on interface elastic wave guidance, laser probing of elastic vibration distributions, elastic attenuation, and the properties of counter-poled plates. Author (GRA)

N82-12972# State Univ. of New York at Albany. Dept. of Physics.

MEASUREMENT OF PAIR-QUASIPARTICLE INTERFERENCE IN JOSEPHSON TUNNEL JUNCTIONS Final Report

Robert I. Gayley 10 Jun. 1981 43 p refs Presented at the 1980 Appl. Superconductivity Conf.
(Contract N00014-77-C-0415)
(AD-A105251) Avail: NTIS HC A03/MF A01 CSCL 20/10

A successful program for applying the microscopic theory to the computation of the time-dependent behavior of a Josephson junction has now been developed. It was based, originally, on one due to D. MacDonald of NBS Boulder, but extensive modifications had to be made in order to bring the computation time and computer memory requirements down to levels that made it possible to deal with the kinds of problems I wished to attack. Such computations are very demanding because a junction has a long 'memory'. Its behavior at some moment is dependent on its history over a long time interval in the past. It can be shown that the length of this memory is directly related to the sharpness of the voltage jump that appears in the junction current-voltage characteristic at the gap voltage. R. Harris of NBS Boulder has pointed out that real junctions do not have as

sharp a jump as theory predicts, and this implies that their memories are not as long as theory suggests. I investigated this question and found that artificially shortening the theoretical memory does indeed lead to rounding of the jump at the gap voltage. I found that the amount of shortening that is required to give a reasonable rounding is in fact enough to produce an appreciable reduction in both computation time and computer memory requirements. GRA

N82-12973# Army Electronics Research and Development Command, Fort Monmouth, N. J.
FURTHER INVESTIGATION OF ETCHANTS FOR CHEMICALLY POLISHING SC-CUT QUARTZ CRYSTALS
Ronald J. Brandmayr and John R. Vig Sep. 1981 19 p refs (DA Proj. 1L1-62705-AH-94)
(AD-A104903; DELET-TR-81-16) Avail: NTIS HC A02/MF A01 CSCL 20/2

A series of solutions were investigated for chemically polishing SC-cut quartz crystals. Solutions of concentrations were prepared. It was determined that some of these solutions can chemically polish SC-cut crystals in less time than solutions previously reported. Shorter etching time minimizes the problem of water evaporation from the etching bath. Also, the new solutions are easier to prepare than those employing NH subscript 4 F.
Author (GRA)

N82-12974# Oregon State Univ., Corvallis. Dept. of Physics
TDPAC STUDY OF THE In2Se3 CRYSTAL STRUCTURE
Karl Krusch and John A. Gardner 17 Aug. 1981 25 p refs Submitted for publications
(Contract N00014-79-C-0668; NR Proj. 056-721)
(AD-A104729; TR-3) Avail: NTIS HC A02/MF A01 CSCL 20/2

The time-differential perturbed angular correlation (TDPAC) technique has been used to investigate the temperature dependence of the electric field gradient (EFG) at Cd impurities in the semiconducting compound In2Se3. Between room temperature and the melting point, four different phases could be observed. Most crystal structures which have been proposed for the alpha and beta phases are shown to be incorrect. The beta prime phase (550-720 C) has not been reported previously. The data suggests that the beta phase may be a Peierls distortion of the beta prime phase. The EFG in the alpha phase is well described by a simple point charge model suggesting that the electronic part of the EFG is alpha - In2Se3 is small. GRA

N82-12975# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering.
OPTICAL CONSTANTS OF BORON CARBIDE Final Report
James L. Lauer 14 Aug. 1981 130 p refs
(Contract N00164-79-M-2522)
(AD-A105451; NWSC/CR-RDTR-150) Avail: NTIS HC A07/MF A01 CSCL 20/6

The optical constants n and k have been determined in the 700 - 1200 per cm wavenumber region for a boron carbide flat of compressed 2 micrometer diameter particles by the polarized reflection method. A broad absorption band has been found near 1050 per cm, where k reached values of 1 to 2 and n of lower than 1.5. The scatter of the data points was large, probably because of the demonstrated presence of up to 10% of iron oxide on the surfaces (by SEM/X-ray). More accurate procedures are suggested for future work. The suspension of the particles in one arm of a Michelson interferometer is probably the most direct and superior method for obtaining n and k for such particles. Author (GRA)

N82-12976# BDM Corp., Albuquerque, N. Mex.
ANALYSIS OF THE TEMPERATURE DEPENDENCE OF RESISTIVITY IN N-TYPE SILICON Final Report, 11 Feb. 1979 - 30 Apr. 1980
Marilyn Glaubensklee 16 Mar. 1981 35 p refs
(Contract DNA001-79-C-0138)
(AD-A105192; BDM/TAC-80-089-TR-R1; DNA-5297-F) Avail: NTIS HC A03/MF A01 CSCL 20/12

This work consists of an analytical development of the observed temperature dependence of the resistivity in n-type silicon. This is accomplished by considering the temperature dependence of each physical parameter (such as electron scattering terms) contributing to resistivity in various doping ranges. Author (GRA)

N82-12977# Hoffman (P. R.) Co., Carlisle, Pa.
AUTOMATED X-RAY ORIENTATION FOR QUARTZ CRYSTAL RESONATORS Interim Report, 1 Jul. - 31 Dec. 1980
Robert W. Birrell, Robert J. Valihura, John L. Chambers (Advanced Research and Applications Corp.), Myron A. Pugh (Advanced Research and Applications Corp.), and Thomas A. Workman (Advanced Research and Applications Corp.) Fort Monmouth, N.J. Army Electronics Research and Development Command Sep. 1981 73 p refs
(Contract DAAK20-79-C-0254; DA Proj. 1L1-62705-AH-94)
(AD-A104945; DELET-TR-79-0254-3; IR-3) Avail: NTIS HC A04/MF A01 CSCL 09/1

The objective of this program is to develop an automatic X-ray orientation system (AXROS) that is capable of measuring the angles of cut of doubly rotated (SC) quartz crystals, to an accuracy of seconds of arc, on a production basis. The technique selected for the system utilizes recognition of several major spots in a back-reflected Laue pattern in conjunction with a laser measurement of crystal surface orientation to determine the angle of cut. The pattern recognition is done via an algorithm implemented on a dedicated mini-computer. The same computer also drives servo-mechanisms used to rotate and position the crystal. A secondary objective of the program is to use the AXROS measurements to provide the input for an angle correction device to be implemented in conjunction with the AXROS.
Author (GRA)

N82-12978# Stanford Linear Accelerator Center, Calif.
FUNDAMENTAL TESTS AND MEASURES OF THE STRUCTURE OF MATTER AT SHORT DISTANCES
Stanley J. Brodsky Jul. 1981 38 p refs Presented at the 2nd Intern. Conf. on Precision Meas. and Fundamental Constants, Washington, D.C., 8-12 Jun. 1981
(Contract DE-AC03-76SF-00515)
(DE81-030644; SLAC-Pub-2776) Avail: NTIS HC A03/MF A01

Recent progress in gauge field theories has led to a perspective on the structure of matter and basic interactions of short distances. It is clear that at very high energies quantum electrodynamics, together with the weak and strong interactions, are part of a unified theory with fundamental constants, symmetries, and conservation laws. A nontechnical introduction to these topics is given, with emphasis on fundamental tests and measurements. DOE

N82-12979# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
STUDY OF Al/Si INTERFACE BY PHOTOEMISSION, AUGER ELECTRON SPECTROSCOPIES
K. L. I. Kobayashi, J. Barth, F. Gerken, and C. Kunz Jun. 1980 15 p refs
(DESY-SR-80/08) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Photoemission, Auger electron yield, and Auger electron spectra were observed for Al/Si(111) interfaces with various Al coverage prepared by successive deposition using a moleculr beam source. The Al 3p derived states are introduced at around the top of the valence band by the Al coverage of less than one monolayer. The Al surface layer behaves as a 'metal' and the Fermi level is stabilized in the Al 3p derived states at about 0.3 eV above the top of the valence band of Si. The Schottky barrier height in this stage is about 0.8 eV and further increase in Al coverage does not change the barrier height. A covalent bonding model of the Al/Si interface based on the experimental results is proposed. The present result favors the on-top geometry of Al atoms on Si(111) surface among the geometries used in the pseudopotential calculation by Zhang and Schlueter. DOE

N82-12980# AEG-Telefunken, Heilbronn (West Germany). Geschaeftsbereich Halbleiter.
SILICON TRANSPORT EPITAXY Final Report
Peter Duro Braun Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 126 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-165; ISSN-0340-7608) Avail: NTIS HC A07/MF A01

Selective epitaxial deposition of silicon was obtained. The epitaxial growth of silicon and the conditions for selective deposition were investigated at temperatures as low as 600 C. During investigations of the dopant incorporation, anomalous behavior of n-type dopants was discovered, and called hyperdoping. A radiation heated horizontal reactor was developed. A fully developed production process for low voltage Zever diodes was realized. Silicon transport epitaxy also proves to function in an open tube process, and selective deposition can also be achieved under these conditions. The epitaxial growth allows the use of nitrogen as carrier gas. Author (ESA)

N82-12981# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).

ELECTRO-OPTICAL EFFECTS IN LIQUID CRYSTALS FOR DISPLAY USE Final Report

Guenter Baur, Gerhard Meier, Hanspeter Schad, Axel Stieb, Waltraud Fehrenbach, and Friedrich Windscheid Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 119 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-200; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25

Improvements of the twisted nematic liquid crystal cell are considered. The material properties of liquid crystals were investigated. The structure of the alignment defects, occurring at the edges of the electrode segments in liquid crystal layers with a small tilt angle, could be cleared up. The dependence of optical appearance on the observation angle were calculated to optimize the twisted nematic cell by variation of the material parameters. The interdependence of contrast and brightness is investigated for different types of dichroic liquid crystal cells. A figure of merit for reflective display cells is defined.

Author (ESA)

N82-12982# Wacker-Chemie G.m.b.H. Burghausen (West Germany). Bereich GA.

RESEARCH AND DEVELOPMENT ON NEW TECHNOLOGIES FOR THE PREPARATION OF III-V SEMICONDUCTOR MATERIALS AND ON METHODS FOR EVALUATION OF THE QUALITY OF THESE MATERIALS. PROJECT Ga(AsP) EXPITAXIAL LAYERS AND SUBSTRATES FOR THEM Final Report

Norbert Stath Bonn Bundesministerium fuer Forschung und Technologie Feb. 1981 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-020; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

Methods for series production of GaAs 0.6P0.4 layers on gallium arsenide and geranium substrates were developed. The influence of temperature, composition of the gas phase, and substrate preparation were examined and optimized. The layers were tested by Hall effect and photoluminescence measurements, and the quantum efficiency was determined by means of zinc diffused test diodes. Epitaxial layers were also successfully tested in the production lines of a German and an American light emitting diode manufacturer. Layers of GaAs(0.65)P(0.35) deposited on gallium phosphide substrates show good crystal quality, but the quantum efficiencies need further development. Cutting and polishing of gallium arsenide and gallium phosphide wafers were developed to production maturity. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N82-12983 California Univ., San Diego.

COLLECTIVE EFFECTS IN DIFFUSE AMBIPLASMA Ph.D. Thesis

Shelley Hill Rogers 1981 172 p

Avail: Univ. Microfilms Order No. 8120539

Astronomical observations reveal no signs of antimatter on a large scale. If matter and antimatter exist in separate regions without, in effect, interacting there must be a repulsive force between the matter and antimatter that prevents them from mixing; in particular, such a force is crucial to the coexistence of large, diffuse regions akin to the galactic interstellar clouds. A previously proposed mechanism in which a thin, magnetized layer of ambiplasma keeps matter and antimatter plasmas separated with the energy released in occasional annihilation to dynamic collisions between diffuse regions and specifically to collisions between unmagnetized plasmas and between magnetized atomic clouds. A model for the generation of magnetic fields by an electromagnetic instability was developd from Vlasov and quasi-linear theories. The character of collisionless shocks driven by annihilation-electron currents was derived by matching four physical requirements self-consistently. Dissert. Abstr.

N82-12984# National Aerospace Lab., Tokyo (Japan).

ANALYTICAL EXPRESSIONS FOR SPECIFIC HEATS AND ISENTROPIC EXPONENTS OF HIGH-TEMPERATURE GASES WITH THEIR APPLICATIONS

Riichi Matsuzaki and Noriaki Hirabayashi 1981 46 p refs In JAPANESE; ENGLISH summary

(NAL-TR-671; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Exact analytical expressions for the specific heats and isentropic exponents were obtained for several sets of high temperature gases composed of dissociated and ionized species in thermodynamic equilibrium. The sets of species considered are: monatomic gas (A, A+, A++, e-), pure diatomic gas (A2, A, A2+, A+, e-), heteronuclear diatomic gas (AB, A, B, AB+, A+, B+, e-), triatomic gas (AB2, A2, B2, A, B, AB, A2B), and a model air (O2, N2, O, N, NO, O+, N+, NO+, O2+, N2+, e-). For another model of air including Ar and Ar+, an approximate method for calculating specific heats and isentropic exponents is proposed. Second virial correction terms for thermodynamic properties are also derived analytically. The corrected values of the specific heats and isentropic exponents at high density reveal better agreement with available tables. Debye-Huckel correction can be neglected in the present ranges of temperature and pressure. Simple applications to the study of equilibrium flow of air around a corner and in a nozzle show that these analytical expressions are useful in practical purposes. R.J.F.

N82-12985# Oklahoma Univ., Norman. School of Chemical Engineering and Materials Science.

DEVELOPMENT OF A THERMODYNAMIC PROPERTIES CORRELATION FRAMEWORK FOR THE COAL CONVERSION INDUSTRY, PHASE 1A Annual Report, 1 Sep. 1980 - 31 Aug. 1981

K. E. Starling, L. L. Lee, K. H. Kumar, M. R. Brule, S. Watanasiri, V. Gupta, M. H. Li, R. McFall, W. Chang, C. K. So et al 1981 33 p ref

(Contract DE-FG22-80PC-30249)

(DE81-030363; DOE/PC-30249/T2; AR-1) Avail: NTIS HC A03/MF A01

A three-parameter corresponding states framework developed originally for light hydrocarbons was modified to rapidly develop a practical thermodynamic properties prediction capability for the coal conversion industry. The three-parameter corresponding states correlation describes the thermodynamic behavior of pure nonpolar and slightly polar nonassociating coal fluids and mixtures for which the mixture constituents are known. Characterization

techniques are outlined for converting distillation analysis of underfined mixtures (with composition available in terms of broad fractions) into representative pseudo components. Empirical correlations are developed to estimate the three corresponding states characterization parameters for each fraction from measurements made on the fraction (boiling point, specific gravity, molecular weight). Results for one and two ring polar and associating coal fluids indicate that an extension of the corresponding states methodology to associating fluids using a five-parameter correlation is possible. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-12986# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN EXPLORATORY STUDY OF COSTS TO OPERATE GOVERNMENT-OWNED, CONTRACTOR-OPERATED (GOCO) FACILITIES M.S. Thesis
William O. Bennett and Mark L. Hodges, Jr. Jun. 1981 124 p refs
(AD-A104854; AFIT-LSSR-43-81) Avail: NTIS HC A06/MF A01 CSCL 05/1

During World War II, the U.S. Government recognized a need to expand the nation's industrial base. The government decision was to build production facilities and contract with private firms to operate them. In 1970 the Secretary of Defense issued a directive to sell many government facilities. As of 1980, 147 remained in government possession, being managed differently by each DOD component. The researchers sought to determine if management structure impacted upon operational costs of GOCOs. The researchers discovered that operational cost data were not readily available DOD-wide. A study of Army ammunition GOCOs was conducted to determine if sufficient correlation between costs of operating GOCOs could be found to justify the expense of data collection for hypothesis testing. The results of the study showed positive correlation between operation and maintenance costs of GOCOs and total costs of GOCOs. Production costs were not found to be significantly correlated to operation and maintenance costs. Evidence of a structural variable impacting upon production cost was found. The study recommended further study to refine the cost data, then further research into operational costs and management structure. Author (GRA)

N82-12987# Scientific Service, Inc., Redwood City, Calif.
AN APPROACH TO THE MANAGEMENT OF HAZARDOUS MATERIALS Final Report
J. V. Zaccor, H. L. Hsu, and C. Wilton Sep. 1981 103 p refs (Contract EMW-C-0432)
(AD-A104869; SSI-8043-4) Avail: NTIS HC A06/MF A01 CSCL 13/12

This report describes an approach to hazardous material emergency management that includes organizing, relating, and keeping track of decision information being developed in the various operating sectors. Ongoing hazardous materials data collection, done by different Federal, State, local, and private agencies, is not coordinated. A simple, pragmatic decision information system with a standard data acquisition format is needed. A matrix approach, where data are acquired and developed to determine ranking problems, may be an answer. Information exchange media are examined and assessed for potential effectiveness in transferring the acquired and developed information to the area where information needs are greatest - the level of first responder. Test communities should be established to participate in information exchange programs. Author (GRA)

N82-12988# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
ASSIGNMENT TECHNIQUES FOR HEAVILY LOADED NETWORKS [TOEDELINGSTECHNIEKEN VOOR ZWAAR BELASTE NETWERKEN]
H. E. R. Meinjer Delft Netherlands Organization for Applied Scientific Research TNO Oct. 1979 38 p refs In DUTCH
(A-79-VK-45-07) Avail: NTIS HC A03/MF A01

A survey of the most important assignment methods is presented. It is based on literature reviewing, except for the equilibrium assignment method and it is limited to models for one traffic method with fixed demands, where the effects of congestion on the assignment result are taken into account. The two equilibrium methods treated use a monotonically increasing function linking current and resistance, and result in a unique solution where all the employed routes between origin and destination have the same resistance and the nonemployed routes have higher resistance. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-12989# Office of Technology Assessment, Washington, D. C.
COMPUTER-BASED NATIONAL INFORMATION SYSTEMS: TECHNOLOGY AND PUBLIC POLICY ISSUES
Sep. 1981 203 p refs
(OTA-CIT-146; LC-81-600144) Avail: SOD HC

Developments in computer and information management technology and their impact on society are discussed. Among the issues discussed are the following: innovation, productivity, and employment; privacy, security of computer information; government management of data processing; society's dependence on information systems; and the constitutional rights and regulatory boundaries affected by information systems. For individual titles, see N82-12990 through N82-13003.

N82-12990# Office of Technology Assessment, Washington, D. C.
COMPUTER-BASED NATIONAL INFORMATION SYSTEMS: TECHNOLOGY AND PUBLIC POLICY ISSUES. SUMMARY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 3-25
(For primary document see N82-12989 03-82)
Avail: SOD HC

The structure of information policy issues was examined. Information policy, law, and regulation were studied. System issues, information issues, secondary policy impacts, and long-term societal effects are discussed. Government management of data processing and its implications are also discussed. T.M.

N82-12991# Office of Technology Assessment, Washington, D. C.
BACKGROUND AND PURPOSE OF THE STUDY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 29-34
(For primary document see N82-12989 03-82)
Avail: SOD HC

As computer-based national information systems become more important to American society, particularly for Government administration, they create corresponding public policy problems. These problems are discussed and include: the design, procurement, and operation of Government data systems; the potential for Government agencies to abuse the large record systems they operate that contain personal data; the effects of computer technology on the structure and operations of the banking industry; the role of the Postal Service in providing electronic message service; problems concerned with the protection of privacy and

constitutional rights presented by the use of large automated data systems; and the impact of information technologies on copyright laws. T.M.

N82-12992# Office of Technology Assessment, Washington, D. C.
INFORMATION SYSTEMS AND COMPUTERS
In its Computer-based Natl. Inform. Systems Sep. 1981 p 37-43 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

Computers carry out a wide variety of tasks associated with processing information. It is important to understand the entire range of these capabilities in order to appreciate the nature and magnitude of the potential social impacts of this technology when used in information systems. Computer capabilities are discussed and include: data collection, information storage, information organization, calculations, communication, information presentation, and numerical control. T.M.

N82-12993# Office of Technology Assessment, Washington, D. C.
INFORMATION IN SOCIETY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 47-54 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

The nature of information is discussed. The commercial value, public value, and private value of information are considered. The role of information as an economic commodity on the development of the economy was examined. T.M.

N82-12994# Office of Technology Assessment, Washington, D. C.
THE STRUCTURE OF INFORMATION POLICY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 55-61 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

Current policies governing information systems are a composite of many specific regulations and laws, which are based on three main factors: the areas affected or the regulatory concerns (privacy, freedom of information, etc.); the affected sector of society (banking, education, Government, etc.); and the lawmakers and/or rulemakers (Congress, the Federal Communications Commission, State legislatures, etc.). Areas of law and regulation that affect information systems or are affected by them are discussed. T.M.

N82-12995# Office of Technology Assessment, Washington, D. C.
INNOVATION, PRODUCTIVITY, AND EMPLOYMENT
In its Computer-based Natl. Inform. Systems Sep. 1981 p 65-70 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

The structure of innovation and product development in the computer industry is discussed. Basic research in computer science is based on the technology rather than on physical laws. Thus, the leadtime between a fundamental theoretical advance in computer science and a practical application is, in general, relatively short, a few years of less. The vitality of the industry is in part based on the vitality of academic computer science and industrial computer science. The competition between the university and the commercial laboratories are highlighted. T.M.

N82-12996# Office of Technology Assessment, Washington, D. C.
PRIVACY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 73-78 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

Policy issues related to privacy were reviewed on a historical basis. Future privacy issues are discussed and include: an omnibus versus a selective policy on recordkeeping issues, the collection of data, access, and microprocessors and surveillance. T.M.

N82-12997# Office of Technology Assessment, Washington, D. C.
THE SECURITY OF COMPUTER SYSTEMS
In its Computer-based Natl. Inform. Systems Sep. 1981 p 81-86 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

The technology of security was surveyed. Threats and targets were determined and include: theft, sabotage, data alteration, blackmail, extortion, corporate espionage, systems failure, and service interruption. Future security issues are discussed with emphasis on protection of Federal systems and vital domestic information systems. T.M.

N82-12998# Office of Technology Assessment, Washington, D. C.
GOVERNMENT MANAGEMENT OF DATA PROCESSING
In its Computer-based Natl. Inform. Systems Sep. 1981 p 89-94 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

The problems that arise from the Federal Government falling behind the private sector in its use and management of up to date computing technology are discussed. Potentially lost opportunities to use the newest technology to improve the efficiency and effectiveness of Government programs, and increased cost and decreased reliability resulting from operating systems that are becoming obsolete from archaic management procedures are highlighted. T.M.

N82-12999# Office of Technology Assessment, Washington, D. C.
SOCIETY'S DEPENDENCE ON INFORMATION SYSTEMS
In its Computer-based Natl. Inform. Systems Sep. 1981 p 97-102 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

System failures and their implications are discussed. The calculation, assignment, and management of the risks involved with information system failures, were examined. T.M.

N82-13000# Office of Technology Assessment, Washington, D. C.
CONSTITUTIONAL RIGHTS
In its Computer-based Natl. Inform. Systems Sep. 1981 p 105-112 refs (For primary document see N82-12989 03-82)
Avail: SOD HC

Little legal precedent exists, in many cases, for applying constitutional law to the issues raised by computer based information systems. These issues will become incorporated into existing legal precedent. Five areas of constitutional law that may be affected by information systems were examined and they are the first, the fourth, the fifth, the sixth, and the fourteenth ammendment rights. T.M.

N82-13001# Office of Technology Assessment, Washington, D. C.
REGULATORY AND OTHER ISSUES
In its Computer-based Natl. Inform. Systems Sep. 1981 p 115-120 (For primary document see N82-12989 03-82)
Avail: SOD HC

As computer based information systems evolve, they challenge traditional concepts of boundaries - physical or social - that are reflected in the law and regulatory policy. The integration of computer and communication technologies form systems that cross boundaries between nations, states, and organizations. The issues of transborder data flow computer crime, computer software protection, and information gap are discussed and exemplify the kinds of problems created by such integration. T.M.

N82-13002# Office of Technology Assessment, Washington, D. C.
TRENDS IN COMPUTER TECHNOLOGY
In its Computer-based Natl. Inform. Systems Sep. 1981 p 123-143 (For primary document see N82-12989 03-82)
Avail: SOD HC

Computer technology is advancing rapidly. To assess the impacts of information systems, the current state of this technology and where it is heading must be understood. The capability that information technology puts in the hands of the computer user determines the nature of the applications that are developed. Developmental trends shaping the nature of the information based services that will be provided in the coming decade are discussed. T.M.

N82-13003# Office of Technology Assessment, Washington, D. C.
INDUSTRY STRUCTURE
In its Computer-based Natl. Inform. Systems Sep. 1981 p 147-166 (For primary document see N82-12989 03-82)
Avail: SOD HC

The companies examined range widely in size. While the market is clearly dominated in terms of size by the top eight (70 percent of the total revenues), much of the significant market shifting and innovation that will affect the future of computer use are taking place among the smaller companies. The top eight companies are those marketing full lines of general purpose computers, referred to in the industry as mainframe computers. The rest succeed, in general, by focusing on a more limited market sector - very small machines, very large machines, specialized peripheral hardware, or various types of computer services. T.M.

N82-13004 California Univ., San Diego.
REDUNDANCY VERSUS QUERY TIME TRADE-OFFS FOR DATA STRUCTURES Ph.D. Thesis
Dennis James Volper 1981 168 p
Avail: Univ. Microfilms Order No. 8120546

Trade-offs and lower bounds on several data retrieval problems are exploded. The three problems considered are the Range Query problem, the Partial Mach Query problem, and the Slotted Retrieval problem. In the Range Query problem data structure which return the sum of the contents of a contguous portion of an array are studied In the Partial Match Query problem data structure which return the sum of record whose keys match a given partial pattern are studied. In the Slotted Retrieval problem are examined. Data In the Slotted Retrieval problem data structure which return the sum of all but one of the elements in an array are examined. This problem is used to illustrate a situation in which the usual method does not provide a good lower bound. It is also used to illustrate that a data problem which allows solutions that use subtraction can be solved by a more powerful data structure than one which allows only addition. Dissert. Abstr.

N82-13005 California Univ., Los Angeles.
ABSTRACT DATA TYPES AND DATA BASES Ph.D. Thesis
Paolo Paolini 1981 306 p
Avail: Univ. Microfilms Order No. 8121028

Abstract data types (ADTs) describe data through a set of operations and their properties. They are used to write specifications for data behavior and to define programming languages which treat data as abstract objects (i.e., instances of ADTs). Data models for data bases are formally specified as ADTs. Therefore the correctness of their implementation is proven, and the properties of the programs which use them is derived. A technique, based on algebraic definitions of ADTs, is useful for formal definition of data models. Transactions which operate upon a data base are described as abstract operations. A particular technique is developed to formally describe a transaction and to prove the correctness of its implementation. Dissert. Abstr.

N82-13006 Hatfield Polytechnic (England). National Reprographic Centre for Documentation.
VIDEO DISCS: THEIR APPLICATION TO INFORMATION STORAGE AND RETRIEVAL
Alan Horder Jun. 1979 42 p refs
(NRCd-12; ISBN-85267-1709) Copyright. Avail: Issuing Activity

The development of video disks is traced. The main systems are described. Specialized applications in education and industry, e.g. in libraries or advertising, are discussed. Uses in information retrieval are analyzed. Optical systems are most suitable since there is no physical contact between disk and stylus. There is less deterioration in playback quality as a result. Video files have a potential information capacity of 6 billion bits, i.e. 7000 to 8000 times more dense than microfilm.
Author (ESA)

N82-13007# Defense Technical Information Center, Alexandria, Va. Office of Information Systems and Technology.
DEFENSE TECHNICAL INFORMATION CENTER FREE TEXT EXPERIMENT: TECHNICAL REPORT FILE Final Report, Dec. 1979 - Jan. 1981
John L. Carney, Carlynn J. Thompson, and Charles D. Edmondson Oct. 1981 39 p
(AD-A105449) Avail: NTIS HC A03/MF A01 CSCL 05/2

DTIC has conducted an experiment that utilizes the free text inversion technique to retrieve records from the Technical Reports data base. It was felt that free text inversion as a form of retrieval would be beneficial in supporting DTIC's revitalized role in the transfer of technical information. The intent of this project was to determine if the free text inversion technique could be implemented on the DROLS on-line system without severely impacting the on-line system's storage capacity and to determine whether the added capability could improve upon or replace the present practice of using open-ended/identifier indexing terminology. Based on the results of the experiment, it was determined that searching of DTIC's Technical Reports data base is a viable retrieval technique that will provide searchers with an additional enhancement that can be used to augment DTIC's present retrieval methods. However, evidence that will support the use of free text in lieu of the use of identifiers and open-ended terminology remains inconclusive. Additional data collected in a 'live environment' will have to be analyzed before a conclusion can be made concerning the use of open-ended terminology. GRA

N82-13008# Oak Ridge National Lab., Tenn. Dept. of Computer Sciences.
PRELIMINARY INTERNAL DATA SCREENING: A COMPONENT OF QUANTITATIVE DATA ANALYSIS IN DATA VALIDATION
David J. Pack Sep. 1981 35 p refs
(Contract W-7405-eng-26)
(DE81-000502; ORNL/CSD-85) Avail: NTIS HC A03/MF A01

Internal data screening is validation of data by quantitative internal comparisons across records for a given variable, across variables for a given record, across time for a given variable and record, etc. Preliminary internal data screening has the objectives of producing: (1) a frozen, archived data base ready for efficient computer analysis, and (2) a general understanding of key variables, a rough cut at response meaningfulness, a qualification of the type of error present, and an assessment of the expected level of difficulty in the comprehensive validation. The first objective is defined and seen to be achievable through simple computer methodology. Methodological suggestions for accomplishing objectives centering exploratory data analysis techniques of Tukey are made, recognizing these techniques appropriateness for a general examination of a large data base that may contain numerous errors. DOE

N82-13009# Deutsche Bibliothek, Frankfurt (West Germany).
A GENERAL THESAURUS FOR THE GERMAN LIBRARY. PILOT STUDY Final Report
Ingetraut Dahlberg Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 74 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-80-015; ISSN-0170-8996) Avail: NTIS HC A04/MF A01

The kind and form of the terms used by the Deutsche Bibliothek (DB) were analyzed for subject description and tested for their suitability as elements of a general library thesaurus. The possibility and fundamental principles of such a thesaurus, its necessary structure (coverage of subject fields, number of main groupings, depth of hierarchy), the necessary relationships (conceptual and terminological), possibilities of delimitation of the number of terms, the treatment of names and the possibilites of terminological control are considered. The DB terms are considered suitable for a thesaurus, but must be supplemented by terms which may partly be taken from the total of reference terms in order to establish the necessary links to hierarchically higher concepts. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-13010# Eurosat S.A., Geneva (Switzerland).
OVERALL ECONOMIC IMPACT OF AN OPERATIONAL METEOSAT SYSTEM Final Report
J. B. Lagarde, P. Brendle (BETA/ULP), C. Miller, and P. Cohendet (BETA/ULP) Paris ESA Jan. 1981 70 p refs
(Contract ESA-4421/80/F-FC(SC))
(ESA-CR(P)-1457) Avail: NTIS HC A04/MF A01

The METEOSAT concept through its development and well into its expected operational mode, up to 1990 was analyzed. Account was taken of the disturbance introduced by the METEOSAT 1 failure in November 1979, of the delay in the launch of METEOSAT 2, and of the uncertainties arising from the lack of decision, at the end of 1980, on the operational METEOSAT follow-on. Results show important positive economic effects both for the users community (direct benefits) and for the contracting industry concerned (induced benefits).
Author (ESA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-13011# Danish Research Center for Applied Electronics, Hoersholm.
PATENT LICENSING CONTRACTS IN THE ELECTRONIC INDUSTRY [PATENT-LICENSKONTRAKTER I ELEKTRONIKINDUSTRIEN]
Otto Ring Dec. 1980 50 p refs In DANISH; ENGLISH summary
(ECR-104) Avail: NTIS HC A03/MF A01

Licensing conditions are discussed and a check list provided. Licensing agreement problems for the Danish electronic industry are exposed. An annotated bibliography is provided. Use of an expert is recommended for contract negotiations.
Author (ESA)

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-13012*# Stanford Univ., Calif. Cardiology Div.
BIOMEDICAL TECHNOLOGY TRANSFER. APPLICATIONS OF NASA SCIENCE AND TECHNOLOGY Semiannual Report, Jan. - Jun. 1980
Donald C. Harrison 30 Jun. 1980 68 p
(Contract NCC2-52)
(NASA-CR-164991) Avail: NTIS HC A04/MF A01 CSCL 05B

Ongoing projects described address: (1) intracranial pressure monitoring; (2) versatile portable speech prosthesis; (3) cardiovascular magnetic measurements; (4) improved EMG biotelemetry for pediatrics; (5) ultrasonic kidney stone disintegration; (6) pediatric roentgen densitometry; (7) X-ray spatial frequency multiplexing; (8) mechanical impedance determination of bone strength; (9) visual-to-tactile mobility aid for the blind; (10) Purkinje image eyetracker and stabilized photocoalqulator; (11) neurological applications of NASA-SRI eyetracker; (12) ICU synthesized speech alarm; (13) NANOPHOR: microelectrophoresis instrument; (14) WRISTCOM: tactile communication system for the deaf-blind; (15) medical applications of NASA liquid-circulating garments; and (16) hip prosthesis with biotelemetry. Potential transfer projects include a person-portable versatile speech prosthesis, a critical care transport sytem, a clinical information system for cardiology, a programmable biofeedback orthosis for scoliosis a pediatric long-bone reconstruction, and spinal immobilization apparatus.
A.R.H.

N82-13013*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST RESULTS AND FACILITY DESCRIPTION FOR A 40-KILOWATT STIRLING ENGINE Final Report
Gary G. Kelm, James E. Cairelli, and Robert J. Walter Jun. 1981 47 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-82620; DOE/NASA/51040-27; E-871) Avail: NTIS HC A03/MF A01 CSCL 10B

A 40 kilowatt Stirling engine, its test support facilities, and the experimental procedures used for these tests are described. Operating experience with the engine is discussed, and some initial test results are presented
S.L.

N82-13014# Systems Control, Inc., West Palm Beach, Fla. Technology Industries Div.
ANALYSIS OF INTEGRATED FUEL-EFFICIENT, LOW-NOISE PROCEDURES IN TERMINAL-AREA OPERATIONS
J. B. McKinley Jan. 1981 125 p refs
(Contract DE-AC01-80CS-50141)
(DE81-029833; DOE/CS-50141/T1) Avail: NTIS HC A06/MF A01

The specific aviation energy conservation issues, terminal area fuel conservation and airport noise level relationships, are investigated. The potential fuel savings and noise level reduction in the Los Angeles International (LAX) terminal area between 1980 and 1990 attributable to compliance with the noise requirements of FAR Part 36 were quantified. These savings are due to the retiring, retrofiting and re-engining of older narrow-body aircraft (DC-8, B707, etc.) and the growth of wide body aircraft operations (DC-10, B747, B767, etc.). Current noise abatement procedures that could be relaxed without adversely impacting current (1980) noise levels, and at the same time conserving additional fuel. Two FAA computer models were used. The Integrated Noise Model (INM) Version 2.7, was used for noise analysis, and INKMOD, a preliminary fuel burn model, for the fuel analysis. The results of this detailed analysis revealed that due to the changing aircraft mix at LAX to include more wide body aircraft and fewer narrow body aircraft operations, airport noise level will decrease by 8.5 and 9.2 square miles on the 75 Ldn contour for 1985 and 1990, respectively, from the 1980 baseline.
DOE

N82-13015# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
METHOD FOR ESTIMATING TECHNOLOGICAL PENETRATION RATES IN COMMERCIAL AUTOMOBILE FLEETS
J. R. Wagner Nov. 1980 84 p refs
(Contract DE-AC02-76CH-00016)
(DE82-000433; BNL-51312) Avail: NTIS HC A05/MF A01

A technique for estimating market penetration rates of electric and hybrid cars in commercial (including police and nonfederal government) fleets is described. The approach is also applicable to other vehicle technologies in the fleet market. It employs survey data cllected from 142 fleet operators in March 1979. The data describe physical and economic criteria used by fleet operators to select vehicles. This information, together with a variety of derived relationships and constants, provides the basis for a computer simulation model called CPEN (Fleet Car Market Penetration Simulatos). The hypothetical vehicles. The CPEN then produces market penetration estimates, based on the physical capabilities, purchase prices, and discounted life-cycle costs of alternative vehicles.
DOE

N82-13016# Bayer A.G., Krefeld (West Germany). Produktionsbereich Uerdingen.
WET AIR OXIDATION OF WASTE WATER Final Report
Gerhard Friedhofen, Hans Kerres, Joerg Rosenbaum, and Reinhard Thiel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1980 42 p refs In GERMAN; ENGLISH summary

Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-132; ISSN-0340-7608) Avail: NTIS HC A03/MF A01

In order to solve ecological problems, research in laboratories and technical schools on the purification of chemically contaminated waste water by wet air oxidation was carried out and resulted in the construction of a prototype technical plant. The plant is designed for purifying waste water with 12 to 15 t/day organic substances at 320 to 330 C and 160 to 180 bar, and with conversion rates of up to 97%. Inorganic substances in solution can be recycled while the heat of reaction is utilized for steam production. The plant operates at lower costs than biological waste water treatment. Author (ESA)

N82-13017# Science Research Council, Slough (England). Rutherford and Appleton Labs.
STUDY ON A REFINED IMAGE PROCESSING SYSTEM FOR SPACE ASTRONOMY
E. Golton Paris ESA Mar. 1981 258 p
(Contract ESA-4134/79/D-IM(SC))
(ESA-CR(P)-1458) Avail: NTIS HC A12/MF A01

The Madrid IUE data processing systems are reviewed. Recommendations for extending the standby experiment display system (EDS) to provide an offline interactive analysis facility are made. Software design to meet user requirements uses EDS color raster graphics hardware; it evolves in top-down fashion driven by the requirements, and is modular and open ended. It is based on a series of interacting tasks, giving the user power to intermix and overlap analytic processes, and making for maximum power and flexibility. Data and formats likely to be generated by future astronomical satellites are considered and the possibility of common standards and processing requirements is investigated. All such data can be held within a file structure, and can be processed for many applications using a common suite of display and analysis programs. Designs based on an extended EDS computer, a supermini computer, a pipeline processor, and a parallel array processor are presented.
Author (ESA)

N82-13018# Corporate-Tech Planning, Inc., Waltham, Mass.
AUGMENTATION OF RESEARCH AND ANALYSIS CAPABILITIES FOR TIMELY SUPPORT OF AUTOMOTIVE FUEL ECONOMY ACTIVITIES. VOLUME 1: SUMMARY Final Report, Dec. 1977 - Nov. 1979
Theodore Taylor, Jr. Dec. 1980 43 p 3 Vol.
(Contract DOT-HS-7-01789)
(PB81-219479; DOT-HS-805903) Avail: NTIS HC A03/MF A01; also available in set of 3 reports HC E15 as PB81-219461 CSCL 13F

A series of research tasks were undertaken to assess the potential fuel economy improvements for passenger cars and light trucks during the 1980 to 1985 time frame, and later to 1990. Specific subject areas of investigation include: spark ignition engine improvements; fuel economy potential of alternate engines; reductions in tire rolling resistance, aerodynamic drag, and engine friction (through improved lubricants); weight reduction of domestic and certain import passenger vehicles, including a teardown of a Chrysler - Dodge Omni for an analysis of materials and weight and a technology assessment of carbon composites as a future substitute materials. Manufacturing and consumer costs for the fuel economy improvement areas identified, identification of unregulated diesel emission problem areas in need of research and a determination of the cost benefits of petroleum conservation by means other than fuel economy standards are included. GRA

N82-13019# Corporate-Tech Planning, Inc., Waltham, Mass.
AUGMENTATION OF RESEARCH AND ANALYSIS CAPABILITIES FOR TIMELY SUPPORT OF AUTOMOTIVE FUEL ECONOMY ACTIVITIES. VOLUME 2: APPENDICES A THROUGH C Final Report
Theodore Taylor, Jr. Dec. 1980 220 p 3 Vol.
(Contract DOT-HS-7-01789)
(PB81-219487; DOT-HS-805904) Avail: NTIS HC A10/MF A01; also available in set of 3 reports HC E15 as PB81-219461 CSCL 13F

The potential fuel economy improvements for passenger cars and light trucks during the 1980 to 1985 time frame, and later to 1990 were assessed. Automotive technology, product planning, manufacturing costs and transportation energy economics were addressed. Tire rolling resistance, aerodynamic drag, and improved lubrications are covered along with manufacturing and consumer costs, unregulated diesel emission research, and alternate means of petroleum conservation. GRA

N82-13020# Corporate-Tech Planning, Inc., Waltham, Mass.
AUGMENTATION OF RESEARCH AND ANALYSIS CAPABILITIES FOR TIMELY SUPPORT OF AUTOMOTIVE FUEL ECONOMY ACTIVITIES. VOLUME 3: APPENDIX D Final Report, Dec. 1977 - Nov. 1979
Theodore Taylor, Jr. Dec. 1980 204 p refs 3 Vol.
(Contract DOT-HS-7-01789)
(PB81-219495; DOT-HS-805905) Avail: NTIS HC A10/MF A01; also available in set of 3 reports HC E15 as PB81-219461 CSCL 13F

Alternative means of petroleum conservation were surveyed and a preliminary estimate of their possible costs and benefits was derived. The potential for petroleum conservation was analyzed for each sector of the economy. These include: electric utilities, residential and commercial buildings, selected industries, and nonautomotive industries. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-13021 Harvard Univ., Cambridge, Mass.
X-RAY IMAGING OBSERVATIONS OF THE RADIO GALAXIES CEN A, VIR A, AND 3C273 Ph.D. Thesis
Eric Dennis Feigelson 1980 252 p
Avail: Univ. Microfilms Order No. 8120241

Two dimensional X-ray images of three radio galaxies obtained with the high resolution imager and imaging proportional counter on board the Einstein X-ray Observatory (HEAO-b satellite) are reported. Several distinct sources of X-ray emission in these galaxies including the active nucleus, hot interstellar medium, stars, radio lobes and jets are revealed. X-ray jets in all three of these galaxies, demonstrate that highly energetic processes occur in the transport of energy and matter from radio galaxy nuclei to lobes. The strongest evidence to date for inverse Compton X-ray emission from extended radio lobes, and for hydrostatic (in contrast to ram) pressure confinement of radio lobes by a hot external medium is observed. Dissert. Abstr.

N82-13022*# Ohio State Univ., Cleveland. Dept. of Astronomy.
INTEGRATED FLUXES FOR EMISSION LINES IN THE ULTRAVIOLET SPECTRA OF SEVERAL PLANETARIES Final Report, 15 Apr. 1980 - 30 Jun. 1981
Kenneth G. Carpenter and Stanely J. Czyzak Nov. 1981 20 p refs
(Grant NAG5-42; RF Proj. 762100/712767)
(NASA-CR-164986) Avail: NTIS HC A02/MF A01 CSCL 03A

The IUE satellite observatory was used to obtain absolutely-calibrated emission line fluxes for diagnostic lines of multiply-ionized C, N, O, Si, Ne, and Ar which occur in the ultraviolet spectral region of planetary nebulae. These data, when combined with data from the blue, visual, and near infrared, provide improved estimates of ionic concentrations, plasma temperatures and densities, and elemental abundances. B.W.

N82-13023# Helsinki Univ. (Finland). Research Inst. for Theoretical Physics.
INSTANTON EFFECTS IN THE EQUATION OF STATE FOR DENSE NEUTRON STAR MATTER
Carl-G. Kaellman 1979 12 p refs Submitted for publication (HU-TFT-79-19; ISBN-951-45-1682-6) Avail: NTIS HC A02/MF A01

Vacuum fluctuation effects in quantum chromodynamics due to instantons were studied in dense neutron state matter. In the density region of interest to neutron star cores, a density dependence of approximately (n syb B)(-1/3) was found. DOE

N82-13024# Royal Observatory, Edinburgh (Scotland).
ALIGNMENT OF THE CASSEGRAIN AND COUDE OPTICS OF THE 3.8m UK INFRARED TELESCOPE; ASSESSMENT OF THE OPTICAL PERFORMANCE AND RESULTS OF ABERRATION CALCULATIONS
D. S. Brown (NEI Grubb Parsons), C. M. Humphries, T. E. Purkins, and R. V. Willstrop (Cambridge Univ., England) 1 Feb. 1981 39 p
(UKIRT-10; ISSN-0260-9983) Avail: NTIS HC A03/MF A01

The alignment procedures used for the f/9 and f/20 systems of the United Kingdom infrared telescope (UKIRT) are described. For the f/9 system, the primary mirror was positioned radially so that it was centered in the mirror cell by equalizing the combined signals from opposite pairs of the load cells incorporated in the mirror cell. An alignment telescope (AT) was mounted on a flange bolted to the rotatable instrument flange of UKIRT. An alignment fixture was positioned so as to provide an accurate ground surface on which the AT bullseye target reflector could be mounted. Improved performance resulted when the AT was replaced by a Hartmann camera with eyepiece and graticule. Spherical aberration is introduced into the image when the focal plane is displaced axially from the optimum position. Coma results, primarily from misalignment of the primary and secondary mirrors. Astigmation of 0.232 arc sec, are reported for the primary mirror. Author (ESA)

N82-13025# Royal Observatory, Edinburgh (Scotland).
THE REMOVAL, MECHANICAL HANDLING AND INSTALLATION PROCEDURES FOR RE-ALUMINISING THE UKIRT 3.8m PRIMARY MIRROR
Alf A. Neild 28 Jan. 1980 36 p
(UKIRT-11; ISSN-0260-9983) Avail: NTIS HC A03/MF A01

Operational procedures for observatory personnel involved in removing, handling, or installing the mirror of the United Kingdom infrared telescope are outlined. The ordering, location, etc. of chemicals, cleaning materials, safety clothing, equipment, etc. within the observatory are covered. Preparation of the telescope, pickup truck, etc., are detailed. The importance of transporting mirror trolley, mirror boxes, gases, etc., to desired location in advance of their being required is stressed. Six to eight people are required to carry out the operations.
Author (ESA)

N82-13026# Royal Observatory, Edinburgh (Scotland).
METALLIC FILM THICKNESS REQUIREMENTS FOR MIRRORS IN THE INFRARED
C. M. Humphries and H. Seddon 25 Feb. 1980 14 p refs
(UKIRT-13; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

The thickness requirements for mirrors used at wavelengths up to 100 microns and, possibly, up to 1 mm are given. The experimental and calculated reflectance data for aluminum, gold, and nickel coatings in the infrared region are shown. The penetration depth given by d = lambda/4 pi k2 is considered a satisfactory criterion for determining the thickness required for evaporated metallic films. Aluminum coating thicknesses of 1000A give penetration depths sufficient for wavelengths up to 100 microns. Reflectance for three UKIRT mirrors in series is 97% of maximum overall reflectance. Nickel requires thicker coatings than gold, and gives lower maximum reflectances than aluminum in the 0.5 to 10 micron band. The maximum reflectance from gold is slightly higher than aluminum from 2 to 10 microns and thicker coatings are required. At 1 micron the maximum reflectance from gold is significantly higher than of aluminum, but lower at 0.5 microns. Author (ESA)

N82-13027# Royal Observatory, Edinburgh (Scotland).
THIN MIRROR TELESCOPES: EXPERIENCE GAINED WITH THE UK INFRARED TELESCOPE
C. M. Humphries 1 Mar. 1980 9 p ref Presented at Opt. and IR Telescopes for the 1990's Conf., Tuscon, Arizona, Jan. 1980
(UKIRT-14; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

The United Kingdom's infrared telescope has f/q Cassegrain and f/20 coude focal planes and the additional option of an f/35 Cassegrain chopping secondary mirror. The optical system including contributions from the secondary mirror, the respective support systems, and atmospheric viewing gives a Cassegrain image of diameter 1 arcsec (90% incident radiation) and a coude image of diameter 1.25 arcsec. A thin mirror approach is used both for primary and secondary mirrors. The lightweight design concept can be applied to altazimuth as well as equatorial designs and to optical as well as to infrared ground based telescopes. It can be used in conjunction with the segmented or multiple mirror approach. Author (ESA)

N82-13028# Royal Observatory, Edinburgh (Scotland).
COMPUTER AIDED BALANCING OF UKIRT: A PRELIMINARY REPORT
A. McLachlan 14 Mar. 1980 8 p
(UKIRT-15; ISSN-0260-9983) Avail: NTIS HC A02/MF A01

A combination of mechanical and computer techniques used in balancing UKIRT is described, and the computer program used is presented. The balance in one axis of an out of balance telescope can be examined by driving the telescope along the axis towards a given point from opposite directions. At the position, for each direction of movement, the difference between the position demanded and the encoder is calculated. The sum of differences is an indication of the out of balance moment. For a perfectly balanced telescope the sum is zero. Several measurements at different positions of the telescope are necessary to determine the position of the center of gravity relative to the pivot point. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-13029 Harvard Univ., Cambridge, Mass.
TOPICS IN THE EVOLUTION OF COSMOLOGICAL PERTURBATIONS Ph.D. Thesis
Ethan Tecumseh Vishniac 1980 217 p
Avail: Univ. Microfilms Order No. 8120244

The evolution of perturbations of the standard Friedmann cosmology at early times is studied. Special emphasis is placed on those perturbations that remain regular as one approaches the initial singularity. The nature of perturbations much larger than the particle horizon are discussed. A number of widespread beliefs are shown to be incorrect and results are obtained concerning the effect of local variations in the equation of state. Next the growth of perturbations are epochs when a substantial fraction of the energy content of the universe was contained in a collisionless neutrino gas examined. Most perturbations that diverge at early times are strongly affected by the neutrinos. The effect of nonlinear interactions on the evolution of adiabatic perturbations whose scale is much less than the particle horizon. Finally, the evolution of adiabatic perturbations is followed through the era of recombination. The shortest wavelength perturbations that emerge from recombination without suffering attenuation are larger than the largest scale nonlinear clustering observed in the present universe. Dissert. Abstr.

N82-13030*# Columbia Univ., New York. Dept. of Astronomy and Physics.
DATA REDUCTION AND ANALYSIS FOR THE GRAPHITE CRYSTAL X-RAY SPECTROMETER AND POLARIMETER EXPERIMENT FLOWN ABOARD OSO-8 SPACECRAFT Final Project Report, 26 Jun. 1975 - 30 Jun. 1980
R. Novick Aug. 1980 30 p refs
(Contracts NAS5-22408; NAS5-24152)
(NASA-CR-166749; CAL-1471) Avail: NTIS

HC A03/MF A01 CSCL 03B

The documentation and software programs developed for the reception, initial processing (quickbook), and production analysis of data obtained by solar X-ray spectroscopy, stellar spectroscopy, and X-ray polarimetry experiments on OSO-8 are listed. The effectiveness and sensitivity of the Bragg crystal scattering instruments used are assessed. The polarization data polarimetric data obtained shows that some X-ray sources are polarized and that a larger polarimeter of this type is required to perform the measurements necessary to fully understand the physics of X-ray sources. The scanning Bragg crystal spectrometer was ideally suited for studying rapidly changing solar conditions. Observations of the Crab Nebula and pulsar, Cyg X-1, Cyg X-2, Cyg X-3, Sco X-1, Cen X-3, and Her X-1 are discussed as well as of 4U1656-53 and 4U1820-30. Evidence was obtained for iron line emission from Cyg X-3. A.R.H.

N82-13031*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MATTER ACCRETING NEUTRON STARS
P. Meszaros Sep. 1981 21 p refs Presented at the Symp. on Neutron Stars, 5th General Conf. of the European Phys. Soc., Istanbul, 1981 Submitted for publication
(NASA-TM-83835) Avail: NTIS HC A02/MF A01 CSCL 03B

Some of the fundamental neutron star parameters, such as the mass and the magnetic field strength, were experimentally determined in accreting neutron star systems. Some of the relevant data and the models used to derive useful information from them, are reviewed concentrating mainly on X-ray pulsars. The latest advances in our understanding of the radiation mechanisms and the transfer in the strongly magnetized polar cap regions are discussed. Author

N82-13032# University Coll., Cardiff (Wales). Dept. of Mathematics and Astronomy.
THE UNIVERSE: PAST AND PRESENT REFLECTIONS
Fred Hoyle May 1981 66 p refs
(Preprint-70) Avail: NTIS HC A04/MF A01

The age of the universe is considered. The big bang theory is attacked on the grounds that it does not allow enough time for life to develop. The chance of a random shuffling of amino acids producing a workable set of enzymes is estimated at less than 10 to the minus 40,000th power. The big bang theory postulates 10 billion years as the age of the universe. The initial stages would have been unsuitable for the generation of life because of the harmful radiation present. The biochemical structure of enzymes has changed little during the past 4 billion years. The time remaining is too short, so the Universe must be older than 10 billion years. Moreover, since the Universe is defined as 'everything' it is illogical to limit it in time. Time is part of the Universe, not one of its limiting characteristics. Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-13033*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RIGID SHELL COMPONENT FOR SUPERROTATION IN PLANETARY ATMOSPHERES: ANGULAR MOMENTUM BUDGET, MECHANICAL ANALOG AND SIMULATION OF THE SPIN UP PROCESS
H. G. Mayr and I. Harris Sep. 1981 47 p refs Presented at the 12th Ann. Meeting of the Div. for Planetary Sci. of the Am. Astron. Soc., Tucson, Ariz., Oct. 1980
(NASA-TM-83831) Avail: NTIS HC A03/MF A01 CSCL 03B

An analysis of superrotation in the atmosphere of planets, with rotation axis perpendicular to the orbital plane is presented. As the atmosphere expands, Hadley cells develop producing a redistribution of mass and angular momentum. A three dimensional thermally driven zonally symmetric spectral model and Laplace transformation simulate the time evolution of a fluid leading from corotation under globally uniform heating to superrotation under globally nonuniform heating. For high viscosities the rigid shell component of atmospheric superrotation can be understood in analogy with a pirouette. During spin up angular momentum is transferred to the planet. For low iscosities, the process is reversed. A tendency toward geostrophy, combined with increase of surface pressure toward the poles (due to meridional mass transport), induces the atmosphere to subrotate temporarily at lower altitudes Resultant viscous shear near the surface permits angular momentum to flow from the planet into the atmosphere propagating upwards to produce high altitude superrotation rates. M.D.K.

N82-13034*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE GLOBAL CIRCULATION AND THE HURRICANE SYSTEM OF THE JOVIAN ATMOSPHERE
H. G. Mayr, K. Meada, and I. Harris Sep. 1981 22 p refs
(NASA-TM-83833) Avail: NTIS HC A02/MF A01 CSCL 03B

An argument is made to support the proposal that Jupiter's red spot and the white and brown ovals are hurricanes or cyclones. Against the background of a convectively unstable troposphere, the general condition exists for the formation of hurricanes. The energy Jupiter emits must be transported upwards through the troposphere. If that transport is accelerated by the prevailing upward motions in the solar driven multicellular meridional circulation, eastward jets develop such as observed in the I region. But if that vertical transport is impeded by the prevailing downward motions in the meridional circulation, the atmosphere reacts and tends to maintain the process through the development of hurricanes. Dynamically induced by solar differential heating, an ordered latitudinal structure with alternating stability and instability is impressed on the troposphere to form alternating zonal strata where hurricanes are forbidden and permitted, respectively. B.W.

N82-13035*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRUCTURE AND ORIGIN OF COMETARY NUCLEI
Bertram Donn and Jurgen Rahe Sep. 1981 39 p refs Submitted for publication
(NASA-TM-83823) Avail: NTIS HC A03/MF A01 CSCL 03B

There is strong evidence that a comet nucleus consists of a single object whose basic structure is Whipple's icy conglomerate. A number of cometary phenomena indicate that the nucleus is a low density, fragile object with a large degree of radial uniformity in structure and composition. Details of the ice-dust pattern are more uncertain. A working model is proposed which is based on theories of accumulation of larger objects from grains. This nucleus is a distorted spherical aggregate of a hierarchy of ice-dust cometesimals. These cometesimals retain some separate identity which lead to comet fragmentation when larger components break off. The outer layers of new comets were modified by cosmic ray irradiation in the Oort Cloud. The evidence for meteorite-comet association is steill controversial. Current dynamical studies do not seem to require a cometary source of meteorites. A.R.H.

N82-13036*# Cornell Univ., Ithaca, N. Y Center for Radiophysics and Space Research.
RADAR INVESTIGATION OF ASTEROIDS Semiannual Status Report, 1 May - 31 Oct. 1981
Steven J. Ostro Nov. 1981 14 p refs
(Grant NAGw-116)
(NASA-CR-164997) Avail: NTIS HC A02/MF A01 CSCL 03B

Software to support all stages of asteroid radar observation and data analysis is developed. First-order analysis of all data in hand is complete. Estimates of radar cross sections, circular polarization ratios, and limb-to-limb echo spectral bandwidths for asteroids 7 Iris, 16 Psyche, 97 Klotho, 1862 Apollo, and 1915 Quetzalcoatl are reported. Radar observations of two previously unobserved asteroids were conducted. An Aten asteroid, 2100 Ra-Shalom, with the smallest known semimajor

axis (0.83) was detected. Preliminary data reduction indicates a circular polarization ratio comparable to those of Apollo, Quetzalcoatl, and Toro. S.L.

N82-13037*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ORBIT IMPROVEMENT OF THE SATELLITES OF THE OUTER PLANETS Final Report, 1 Nov. 1973 - 30 Apr. 1981
Kaare Aksnes and Fred Franklin Nov. 1981 7 p refs
(Grant NGR-09-015-213)
(NASA-CR-164987) Avail: NTIS HC A02/MF A01 CSCL 03B

Data reduced from 127 plates showing Jupiter's and Saturn's satellites in the interval 1972 to 1974 are available on computer cards in the form of (O-C) residuals. Initial orbit calculations and several later orbit improvements for Jupiter XIII (Leda) culminated in an extended ephemeris for Leda to the year 2000. The possible existence of several small satellites just outside Saturns rings was predicted. De Sitter's incomplete theory for the motion of the Galilean satellites was reviewed and an outline for a revised, complete theory was developed. Observations of nearly 100 relative positions of the Galilean satellite with a mean accuracy of about 100 km (0.03 arc sec) were used to improve Sampson's theory for these satellites. Results were published on (1) a long term upper limit to Jupiter's orbital eccentricity; (2) deviation of an accurate modern value of the ellipiclity of Uranus from balloon-borne images and consequent evaluation of the planet's rotation rate; and (3) identification of features in Saturn's rings as produced by heretofore undetected tesseral harmonics of Saturn's gravitational field. A.R.H.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-13038 Harvard Univ., Cambridge, Mass.
X-RAY OBSERVATIONS OF STELLAR CORONAE Ph.D. Thesis
Kenneth Paul Topka 1980 265 p
Avail: Univ. Microfilms Order No. 8120242

Data from the 8.5 magnitude stellar survey and the Gliese survey of all nearby stars listed in either of the two catalogs of the nearest stars that accidentally fell into any Einstein observation are presented. The results of the 8.5 and Gliese survey have been integrated with those of four other Einstein surveys. A correlation of X-ray luminosity with spectral type (soft X-ray H-R diagram) is presented. The observations are explained by the presence of hot coronae around stars of nearly every spectral type. However, the data is at variance in many respects to existing theoretical coronal models based on acoustic flux dissipation. The presence of stellar outer convection zones, surface magnetic fields, and rotation rates are discussed. Dissert. Abstr.

N82-13039*# Hughes Research Labs., Malibu, Calif.
STUDY OF RADIATIVELY SUSTAINED CESIUM PLASMAS FOR SOLAR ENERGY CONVERSION Final Report, 1 Jul. 1978 - 30 Jun. 1980
A. J. Palmer and G. J. Dunning Jul. 1980 67 p refs
(Contract NAS2-10001)
(NASA-CR-166265) Avail: NTIS HC A04/MF A01 CSCL 10A

The results of a study aimed at developing a high temperature solar electric converter are reported. The converter concept is based on the use of an alkali plasma to serve as both an efficient high temperature collector of solar radiation as well as the working fluid for a high temperature working cycle. The working cycle is a simple magnetohydrodynamic (MHD) Rankine cycle employing a solid electrode Faraday MHD channel. Research milestones include the construction of a theoretical model for coupling sunlight in a cesium plasma and the experimental demonstration of cesium plasma heating with a solar simulator in excellent agreement with the theory. Analysis of a solar MHD working cycle in which excimer laser power rather than electric power is extracted is also presented. The analysis predicts a positive gain coefficient on the cesium-xenon excimer laser transition. R.J.F.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-13040 State Univ. of New York at Stony Brook.
A STUDY OF GALACTIC LIGHT, EXTRAGALACTIC LIGHT, AND GALACTIC STRUCTURE USING PIONEER 10 OBSERVATIONS OF BACKGROUND STARLIGHT Ph.D. Thesis
Gary Neil Toller 1981 247 p
Avail: Univ. Microfilms Order No. 8120063

The diffuse astronomical background sky brightness (background starlight) was determined over 95 percent of the sky using Pioneer 10 photometric measurements in sky regions where the zodiacal light is negligible. Brightness levels are presented at blue (3950-4850A) and red (5900-6800A) wavelengths. The B-R color index distribution is established over the celestial sphere. A computer model of our galaxy was constructed which computes the emitted and observed brightness from any volume element. The relation between DGL, direct starlight, and extinction along the line of sight is established. A small influence of galactic spiral structure on surface brightness levels exists at 1 = 2 deg (Sagittarius arm), 1 = 69 deg (Orion arm), and 1 = 288 deg (Carina arm). A correlation between brightness features and interstellar extinction is established. Analysis of the distribution of brightness peaks and dips and the location of the brightness symmetry plane establishes the Sun's elevation above the galactic plane as 12.2 + or - 2.1 pc. Dissert. Abstr.

N82-13041*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE NATURE OF THE COSMIC RAY POSITRON SPECTRUM
R. J. Protheroe Oct. 1981 25 p refs Submitted for publication
(NASA-TM-83834) Avail: NTIS HC A02/MF A01 CSCL 03B

A calculation was made of the flux of secondary positrons above 100 MeV expected for various propagation models. The models investigated were the leaky box or homogeneous model, a disk halo diffusion model, a dynamical halo model, and the closed galaxy model. In each case the parameters of these models were adjusted for agreement with the observed secondary or primary ratios and Be 10 abundance. The positron flux predicted for these models was compared with the available data. The possibility of a primary positron component was considered. R.J.F.

99 GENERAL

N82-13042# Office of Naval Research, Tokyo (Japan).
JAPANESE RESEARCH INSTITUTES FUNDED BY THE MINISTRY OF EDUCATION
Seikoh Sakiyama, comp. Jan. 1980 156 p
(ONRT-M2) Avail: NTIS HC A08/MF A01

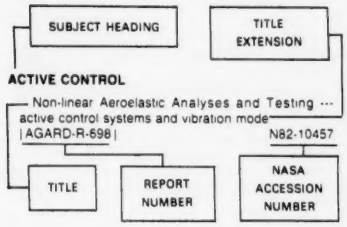
The name, address, and telephone number of 317 research institutes are compiled. Exploraory notes are added where the specialty of the laboratory is not clear. The size of each laboratory, in terms of staff and budget is given. S.L.

N82-13043*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH AND TECHNOLOGY Annual Report
Nov. 1981 68 p

(NASA-TM-83221) Avail: NTIS HC A04/MF A01 CSCL 05B

Langley Research Center is engaged in the basic an applied research necessary for the advancement of aeronautics and space flight, generating advanced concepts for the accomplishment of related national goals, and provding research advice, technological support, and assistance to other NASA installations, other government agencies, and industry. Highlights of major accomplishments and applications are presented. S.L.

Typical Subject Index Listing



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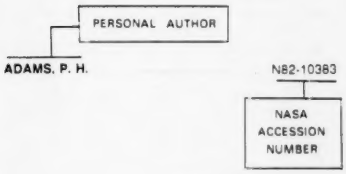

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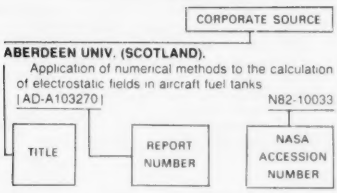

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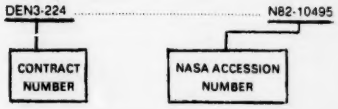

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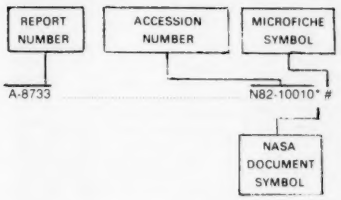

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